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ADDRESS TO THE ROYAL GEOGRAPHICAL SOCIETY.*

By Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President.

The year that has been completed since our last anniversary will be memorable in the annals of our Society for two events, which, though in very different ways, will become important landmarks. The first is what I hope will prove the crowning of the edifice of our educational policy, by the establishment of the School of Geography at Oxford. The second is the generous and patriotic gift by our associate, Mr. L. W. Longstaff, whereby our antarctic enterprise was converted from a weary up-hill struggle to what Lord Torrington and Admiral Colomb would correctly describe as an expedition "in being."

If we succeed in training all our travellers to do valuable scientific work during their wanderings, and if at length we leaven educational establishments of our country with thorough geographical teaching, this Society will indeed have performed a great national service. In the first part of this work I believe that we are making steady progress. The system of instruction under Mr. Coles continues to be a pronounced success. During the past year sixty-two intending travellers have received instruction in practical astronomy in the Society's observatory and in surveying with the theodolite, prismatic compass, and plane-table in the country. This year our diploma has been received by eleven of these students, after successfully passing an examination. Altogether sixteen diplomas have been granted, ten of the recipients being officers in the army, and two officers in the navy. This is our most important educational work, because it has the most direct bearing on our special objects. The presentation of prizes on board the training ships *Conway* and *Worcester* was designed to stimulate interest in

* Read at the Anniversary Meeting, June 5, 1899.

geographical research at a much earlier age. The results since 1882, when the prizes began to be given, have been most satisfactory. Not only is great interest taken in this fascinating subject by the boys themselves, but careful attention is given to their instruction, and the head master of the *Worcester* writes an excellent special treatise every year for the use of the cadets, on the region that has been selected for the subject of examination. It is early to look for practical results in the subsequent careers of our prize cadets, yet one of them has already reached the threshold of an unknown region, and is eager to plan a more thorough exploration.

The policy of the Council, with regard to the promotion of general geographical education, has been modified since 1897. Then we contemplated the establishment of a School of Geography in London; but it was found that, for several reasons, such a plan was impracticable. We then turned to Oxford, believing that one of our ancient seats of learning would offer the best locality, certainly the most fitting locality, for such an institution as we desired to see established. Accordingly I submitted a proposal for the creation of a School of Geography at Oxford, under the joint control of the University and the Society, with expenses shared by the two bodies. My plan was favourably received by the Vice-Chancellor, and by the other authorities whose concurrence was necessary, and an arrangement has now been arrived at which, I believe, will have satisfactory results. Our Society agrees to pay £400 a year, and the University agrees to grant a like sum, towards the expenses of an Oxford School of Geography. It will be under the superintendence of Mr. Mackinder, subject to the supervision of a joint committee consisting, in addition to the Vice-Chancellor, who will have a seat *ex officio*, of four members of the University and three members of our Council. Mr. Mackinder, as University Reader, will lecture twice a week during the three terms, and will also have special classes for advanced students. There will be an assistant who will lecture on physical geography, will hold classes five times a week, and will teach surveying and cartography; and there will be two lecturers, one on certain branches of physical geography, and one on ancient geography. It is expected that undergraduates will attend one or other of the courses of lectures, for already upwards of a hundred undergraduates attend Mr. Mackinder's lectures. It is intended that a diploma shall be granted to students who complete the course, and there will be one or two scholarships of £60. These will be inducements to graduates to spend a year in mastering the principles of geography, and the knowledge required for teaching the science and for making it practically useful. The upper floor of the old Ashmolean building at Oxford has been set apart for the purposes of the School of Geography, and an annual sum will be devoted to the supply of books and appliances.

The deplorable neglect of geography in our public schools is due to

the want of competent instructors, to an absence of appreciation of the importance of geography, and to the system of competitive examinations which has proved to be the great enemy of education and learning. We see the consequences in the geographical ignorance of public men leading to serious mistakes, to risks of war, to refusals of help to useful enterprises; and in the failure of economists, merchants, and others to understand the questions they have to consider in their more important bearings, owing to absence of appreciation of their geographical aspects. We hope that the new School of Geography will, in the course of time, be a remedy for this lamentable neglect of one of the most essential branches of a liberal education. We look forward to our public schools being leavened by a new generation of masters well instructed in the principles of geography, and to new generations of public men whose geographical education will not have been neglected. The great success of our efforts to prepare travellers for the work of exploring, justifies our expectation that when the means of learning are once supplied at Oxford, there will be no lack of desire to avail themselves of it, not only among students in the University itself, but throughout the country. For I wish it to be known and understood that all students will be welcomed at the School of Geography, whether attached to the University or not. It will be the only institution of the kind in the kingdom.

The Council has agreed to continue its contribution to the salary of the reader at Cambridge for another term of years.

The Geographical Association has persevered in its useful labours with a view to promoting and assisting geographical teaching. Mr. Andrews and Mr. Dickenson, under the auspices of the Association, have been devoting themselves to the production of an excellent set of slides illustrating in colour the physical, political, and commercial geography of the continents, the British Isles, and the British Colonies. These slides have been very carefully designed by men who have an intimate knowledge alike of geographical facts and of teaching requirements; and I hope that their educational value will be appreciated, and that they will be extensively used in schools. Numerous orders have, I understand, been already received for them.

Among the agents for disseminating geographical knowledge, our own library and map-room take a prominent place. With regard to the subjects catalogue, the laborious task of entering all the geographical works in the library, including articles and papers in periodicals, has at length been completed. The cards now number 100,850; while the title of every new book, pamphlet, or article is published in the *Journal* and added to the collection of card titles. This means an addition of about 2000 titles every year, a figure which gives some idea of the immense volume of geographical work which is being done in all parts of the world. The collection and writing of these titles is a simple

matter compared with their classification, so as to form a subject index to the library. The cards for all accessions since 1893 are kept fully classified, while the classification of the rest is making steady progress. The great advantages of the card catalogue have been fully demonstrated in the practical work of the library during the last two years. Many Fellows of the Society have expressed their satisfaction at the rapidity with which they have been supplied with references to the literature of the subject of their studies.

The thanks of the Society are due to our librarian for the way in which he has carried through the difficult and heavy work of the subjects catalogue, and for the amount of thought he has bestowed on the complicated questions connected with the classification. We have also to thank Mr. Heawood, not only for the large share he has taken in this very toilsome labour, but also for his valuable contributions to our *Journal*. Mr. Heawood is an accomplished geographer, with an almost unequalled knowledge of the literature of African geography especially. I very much regret that the Society has lost his services for the present, except as a contributor to the *Journal*, but I trust that before long we shall again have the benefit of his valuable co-operation.

The increased use that is made of our library and map-room proves that it is not only our numbers that are increasing, but also the intelligent interest that is taken in our science; and that a far greater number of the Fellows have become students of geography than was formerly the case. While in the year from May, 1895, to April, 1896, the number of Fellows borrowing books was 732, during the twelve months just elapsed the number amounted to 992. But for every one who comes to the library to borrow books, two at least come to consult them. So that geographical information, during the past year, has been supplied directly to fully 3000 persons. In addition to those who come to the library, a considerable number of Fellows and of the general public apply for information by letter, which is always supplied when it falls within the scope of the Society's very wide definition of geography.

In the map-room there has been similar activity in the supply of information, the number of inquirers having increased from 2230 in 1896–97 to 3223 during the present year. Of these 79 came specially to consult the Ordnance Survey Maps.

It had often occurred to me that it would be a great advantage to geographers, and that it would tend to make the narratives of explorers more clear and accurate, if an authoritative list of geographical terms, with definitions, was drawn up for their use. The subject was brought to the notice of the Council by our former Secretary, Colonel Jackson, in 1834. His view was that the adoption and promulgation of a definite and comprehensive system of nomenclature would raise geography to the rank of a positive and exact science. The time now seems to me to

have arrived when Colonel Jackson's valuable suggestion might usefully be adopted. A Nomenclature Committee has accordingly been formed, and a list of 1300 geographical terms has been prepared by Dr. Mill. They have been placed under different headings, and have been distributed among experts for revision and additions, after which they will be more widely distributed for further suggestions. In this way I hope that, before very long, we shall be in a position to suggest a convenient and systematic geographical terminology. At the same time we shall be able to complete a list of obsolete terms, to indicate what words are to be invested with definite technical meanings, and to fix those meanings. I have so often felt the want of help of this kind myself, that I cannot doubt the value it will prove to others.

Turning from our efforts to facilitate and advance the cause of exploration to the work in the field during the last year, I think that there is room for congratulation. In Central Asia Captain Deasy, who was last heard of at Kashgar, has discovered the source of the river Khotan. In Africa good progress is being made in the more thorough work which succeeds the first pioneering discoveries, and prepares the way for that accurate triangulation, the importance of which was impressed upon us by General Chapman at the International Congress in 1895. In the presentation of the medals this day, we have shown how very highly we estimate the value of the scientific labours of distinguished French geographers in Africa. Besides Captain Binger and M. Foureau, who have received the Royal awards, we welcome the return of Major Marchand from his remarkable journey across Africa, the scientific results of which cannot fail to be very important. Our own explorers have not been idle. Colonel Macdonald has just returned from the expedition which he made into the country lying to the north of Uganda, between Lake Rudolf and the Nile. He and the able officers who served under him have done a considerable amount of new geographical work. For the first time the west shore of Lake Rudolf has been accurately laid down by Captain Austin; while Colonel Macdonald himself, the late Captain Kirkpatrick, and other officers, have added many new features to the map of the region they have explored.

Captain G. E. Smith, another officer of Engineers, has placed at the Society's disposal one of the most important pieces of work that have been accomplished in Africa in recent times. It consists of the maps embodying his triangulation of the country from Mombasa to Mount Elgon. This triangulation must form the basis of all future cartographical work in that part of Africa. The valuable survey completed by Captain Close and Captain Boileau in the country between Lakes Nyasa and Tanganyika, for the purpose of fixing the boundary between German and British territory, was executed in concert with a party of German surveying officers. The results have already been submitted to the Society, in the very interesting paper read by Captain Boileau

at one of our recent evening meetings, when Mr. A. L. Wallace also communicated to us an account of his thorough exploration of Lake Rukwa. Further north Captain Wellby, who has already done good work in Tibet, is making his way southwards from Abyssinia, into an almost unknown region of the greatest geographical interest, including the valleys of the upper Sobat and its tributaries. The map of the Blantyre highlands, and the well-executed chart of Lake Nyasa, show that the officials in British Central Africa are diligently engaged on useful surveying work.

I confidently anticipate valuable geographical results from the expedition under Mr. Moore, which recently started for Lake Tanganyika, having received a grant of £600 and a loan of instruments from this Society. The lake itself will be sounded and dredged, the surrounding region will be examined, and geographical work of importance will be done to the northward. An expectation is entertained, not without good grounds, that the investigations of Mr. Moore's expedition will furnish a clue to the physical history of this part of Central Africa. For when a sufficient amount of reliable data has been accumulated by labourers in the field, we look for well-founded generalizations from the leaders of geographical research.

We have recently had a remarkable example of the use that may be made of the work of travellers, in the very able conclusions of Colonel Church, embodied in his admirable address to the geographical section of the British Association last year. He generalized on the physical history of a large area of South America, by piecing together the facts collected by himself and by many other travellers during their exploring work in the field. Much more information is needed by geographers from that most interesting of the partly unknown continents, although a great deal of good work has recently been achieved by South American explorers. Don Francisco Moreno, whose presence in this country on work connected with the Chile-Argentine arbitration, has enabled us to become better acquainted with some parts of his country of which we scarcely knew anything before, has done an immense amount of valuable geographical work. He has explored the eastern slopes of the Patagonian Andes, and discovered numerous alpine lakes, and he surveyed the lofty region of the puna of Atacama; while the museum at La Plata, under his auspices, is an institution where explorers are trained and instructed, and whence geographical information is disseminated. The remarkable journeys of Sir Martin Conway in South America have shown us how much may be done by a keen and instructed observer in a short time. His triangulation of the western slopes of the Cordillera Real from Sorata to Illimani, valuable as it certainly is to cartographers, is not more so than his admirable descriptions of the mountains and of the region round La Paz. His attempted ascent of Mount Sarmiento, in Tierra del Fuego, is a remarkable feat, and is the first

effort that has ever been made to explore the mountains and glaciers of that southern extension of the American continent. No doubt it will not be the last.

The polar regions are receiving more and more attention, because they contain the largest unknown areas in the world, and also by reason of the specially valuable scientific results to be derived from their exploration. There is not yet any news of the American and Norwegian expeditions which have proceeded up Sir Thomas Smith's sound, led by Peary and Sverdrup, with the object of discovering the northern side of Greenland; nor can there be any intelligence of Mr. Wellman, who wintered in Franz Josef Land, until the autumn. But His Royal Highness the Duke of Abruzzi has sailed in the Norwegian whaler *Jason*, re-named the *Stella Polari*, with the glorious cry of "Northward ho!" and, without knowing his special object, for we have not been informed, we bid him heartily "God speed." I hope that British arctic enterprise is not altogether a thing of the past. If it is, we wish all possible success to the friendly emulation of our brother geographers without fear of rivalry. The combined nations of the world will never approach the achievements of Britons in the arctic regions, for all there is left to do is not a tithe of what has been completed under the Union Jack.

The southern polar region is now the great object of our efforts; and I desire particularly to ask your attention to the various aspects of antarctic enterprise, but before doing so we must glance at the proceedings of the Belgian expedition, of that sent out by Sir George Newnes, and at the work of the *Valdivia*.

In August, 1896, the *Belgica* was being strengthened and fitted out at Sandefjord, in Norway. She is a small vessel of 250 tons, built of pine at Drammen about twelve years ago. I visited her with her commander, M. de Gerlache, and saw that the new work was being thoroughly well done, including an outer coating of greenheart. Passing the evening with M. de Gerlache, I was impressed with his knowledge of the subject, and with his youthful enthusiasm. I also saw one of his young assistants, M. Arctowski, and did what I could to further his wishes. The others were M. Danco, who took the magnetic observations; M. Racovitza, the biologist; and Dr. Cook. The gallant adventurers were resolved to do all that was possible in the cause of science, with very limited means which caused delays. It was not until January 14, 1898, that the *Belgica* was able to leave the Straits of Magellan, and shape a course for the South Shetlands. M. de Gerlache has an excellent deep-sea sounding apparatus on board, and seven soundings, with serial temperatures, were taken between Staten island and Bransfield strait. On the 24th Hughes bay was reached, and M. de Gerlache reports the discovery of islands, which he named the Palmer group, and Danco land. Here M. Racovitza collected an insect and a spider, the first of the antarctic land fauna, if, indeed, the South Shetlands

are to be considered antarctic, as well as lichens, mosses, and grasses. On February 12 the *Belgica* entered the Pacific ocean, and steered for Alexandra Land, but was unable to approach it; and on the 28th she was in lat. 70° 20′ S., and long. 85° W. Here M. de Gerlache entered the polar pack, and succeeded in reaching 71° 31′ S., in long. 85° 16′ W. On March 3, as no further progress could be made to the south, the *Belgica's* head was turned northwards, and she bored through a very close pack for 7 or 8 miles; but on the 10th she was finally beset, at a distance of 60 or 70 miles from the edge of the pack, and obliged to winter in it, the sun being absent from May 17 to July 21. The position was 71° 36′ S., in long. 87° 39′ W. As this is the first time that any one has ever wintered in the antarctic regions, the more complete and detailed account of the movements and appearance of the ice throughout the winter months will be extremely interesting. The isolated explorers had the misfortune to lose one of their number, Lieut. Emile Danco, by death on June 5. On the other hand, they were fortunate in the great number of seals and penguins that frequented the neighbourhood of the ship, and enabled them to ensure the preservation of health by a diet of fresh meat. In the spring small openings and channels began to appear in the ice, which was 3 to 6 feet in thickness. During three months all hands were hard at work at a canal to reach open water—a consummation which was attained on March 14 of the present year. The *Belgica* was only once subjected to any pressure from the ice during the winter. On March 28 she returned safely to Punta Arenas. Valuable series of observations were registered throughout the winter, and collections were made from various depths. The expedition of M. de Gerlache will be memorable in the annals of polar exploration alike for its valuable results, and for having been the first that ever wintered within the Antarctic Circle.

Another antarctic expedition was organized by Sir George Newnes and despatched last autumn. A vessel named the *Pollux*, built at Arendal, was purchased and fitted for the work in Norway. She is manned with a crew of twenty-five men, including two mates, two engineers, and a master named Jensen. Her name was changed to the *Southern Cross*. Sir George Newnes informs me that the clothing and provisioning of the expedition received the most careful attention. Mr. Borchgrevink was appointed leader of the landing party and scientific staff, which consists of Mr. Colbeck, R.N.R., and Mr. Louis Bernacchi as magnetic observers, Mr. Evans and Mr. Hansen as zoologists, Dr. Herlof Klovstad as medical officer, and Mr. Fougner as general assistant. They are thoroughly equipped with scientific instruments. The equipment also includes boats, kayaks, and sleighs for dogs, which were procured from Russia.

When the late Mr. Svend Foyn, of Tonsberg, sent the ship *Antarctic* to the southern seas for whaling purposes in 1895, her commander.

Captain Christensen, steamed through the pack and reached the coast of Victoria Land, effecting landings at one of the Possession islands of Sir James Ross, and at Cape Adare. Captain Jensen was one of the mates on board the *Antarctic*, and Mr. Borchgrevink was also serving on board. Leaving England on August 22, Mr. Borchgrevink and Captain Jensen followed the lead of Captain Christensen, and have also succeeded in reaching Cape Adare. They sighted the Balleny islands, and were forty-two days in the pack. But on February 15 last, very high snow-covered land was sighted, during a heavy gale with terrific squalls and a high sea. Next day the gale increased, and on the 17th the *Southern Cross* was anchored in 5 fathoms, at a distance of three quarters of a mile from the beach. A landing was effected on the 18th. The dogs were got on shore with the Finn drivers, and several boat-loads of stores and provisions were landed. But on the evening of the 20th there was another furious gale, the engines were worked at three-quarter speed, to ease the strain on the cables, and during the squalls the deck was actually strewn with pebbles blown from the adjacent mountains. The work of building the house and landing stores was steadily proceeded with from the 21st to the 25th, and on the 26th another terrific gale began. The starboard anchor was lost, the engines were worked at full speed, and at last a refuge was found for the ship at the south end of Robertson bay. On the 27th, three of the party set out to ascend a peak bearing south-south-west from Cape Adare, landing on a pebbly beach. They made for the peak across snow-drifts and glaciers, but were stopped by an inaccessible ice-mass after reaching a height of 2300 feet. The country inland appeared to be an immense undulating plateau covered with glaciers. On the 28th the house was completed, and Mr. Borchgrevink landed with the scientific staff, to winter on this desolate spit of land. The *Southern Cross* then returned, arriving at Port Chalmers, New Zealand, on March 16 last. It is a terribly severe climate, and some anxiety at the hardships the landing-party may be exposed to during the winter is inevitable. There is also the danger of Cape Adare being blockaded by considerable fragments of the pack, as was the case when Sir James Ross discovered it. This would make communication with the shore next year very difficult. We have no experience of men having withstood for months on shore such climatic conditions as Victoria Land presents. But we must hope for the best. The intention is to take a series of magnetic and meteorological observations, make biological collections, and to penetrate inland with dog-sleighs in the spring. Next year the vessel will return to Cape Adare to bring back the landing party. Sir George Newnes informs me that the expedition sails under the British flag, and that the Duke of York showed his interest by presenting the ship with a Union Jack.

This is a most praiseworthy enterprise on the part of a private individual. The observations cannot fail to be valuable, and all concerned

deserve our warmest sympathy for their zeal in facing great hardships and dangers in the cause of science. We cordially wish them all possible success. While M. de Gerlache and his companions are the first to pass a winter within the antarctic circle, the gallant explorers sent by Sir George Newnes are the first to winter on any antarctic land.

The admirably conducted German Deep-sea Expedition, which has just returned to Hamburg, did some valuable work in high southern latitudes, although the *Valdivia* was not adapted for ice-navigation. Leaving the Cape in November, 1898, Bouvet island was re-discovered, and a southerly course was then shaped in the direction of Enderby Land. Reaching drift-ice in 56° 45′ S., they were soon surrounded by numerous icebergs, the highest being a tabular mass rising 193 feet above the water. Further progress was stopped when they reached 64° 15′ S., in long. 54° 20′ E., where there was a depth of 3000 fathoms. It is considered that one of the most surprising results of the expedition is the great depths encountered after leaving Bouvet island. Out of seventeen soundings, no less than eleven showed depths between 2700 and 3300 fathoms. Only fifteen deep-sea soundings had previously been taken south of 50° S. The *Valdivia* added 29, and proved that the Southern ocean was of very great depth. But I consider that the most important information related to indications of the nature of the antarctic continent. These indications are found in the stones carried off the shore and dropped by icebergs. Specimens were collected of gneiss, granite, and schist; and besides, there was a mass of red sandstone weighing 5 cwt. The soundings between Enderby Land and Kerguelen island showed that the ocean floor was strongly folded, depths of 1300 fathoms alternating with great abysses between 2000 and 3000 fathoms. The conduct of the *Valdivia* expedition was admirable in all respects. Great proficiency was attained in deep-sea sounding and dredging, and the excellent manœuvring of the ship in stormy weather was a cause of immunity from loss of sounding-wire. The thoroughness and excellence of the *Valdivia's* work is a subject of congratulation to our brother geographers in Germany.

I will conclude my address with some remarks on our own efforts to secure the despatch of an antarctic expedition on an adequate scale. In my opening address, on November 13, 1893, I brought the subject prominently forward, and we then undertook the difficult task of securing the despatch of such an expedition. In winding up the discussion on Sir John Murray's paper, on the 27th of the same month, I declared that I, for one, would never swerve from that task until it was completed. Nearly six years of effort have passed since those words were spoken, and progress has been slowly but steadily made. I have not been disheartened, for it took me twelve years, with the aid of Admiral Sherard Osborn, whose loss can never be replaced, to secure the despatch of the Arctic Expedition of 1875. Yet, after working from 1862 to 1874,

and enduring several rebuffs, the Prime Minister at last declared that, "having carefully weighed the reasons set forth, the scientific advantages, and the importance of encouraging that spirit of maritime enterprise which has ever distinguished the English people, Her Majesty's Government had determined to organize an arctic expedition." These words were worthy of the representative of a great people. They received the hearty concurrence of the nation, and if such words were once more spoken by a Prime Minister the feeling would be the same, for Britain is ever true to her traditions.

It was considered by our Antarctic Committee, appointed in 1893, that the expedition should consist of two ships, and that it should be under naval discipline, and led by naval officers. This was, therefore, what we advocated, with every reason to expect that the plan would receive favourable consideration. For it was simply a continuation of the enlightened policy of many successive governments during nearly a century and a half. When Commodore Byron's instructions were drawn up in 1764, the government of that day declared that "nothing can redound more to the honour of this nation, as a maritime power, to the dignity of the crown of Great Britain, and to the advancement of its trade and navigation, than to make discoveries of countries hitherto unknown." This noble policy was adopted by successive administrations, and upwards of forty government expeditions have since been sent to the polar regions. This country can proudly point to the results. The early voyages to Spitsbergen led to the great fishery in the surrounding seas. The first voyage of Sir John Ross showed the way into the north water of Baffin's bay. The third voyage of Sir Edward Parry pointed out an equally lucrative fishery up Prince Regent's inlet. Other results might be enumerated. But suffice it to say that polar expeditions have directly led to the enrichment of this country by millions of money, to enabling numerous communities along our seaboard to live in well-to-do comfort, to the employment to a large class of industrious men, and have formed a splendid nursery for our sailors. Their scientific results are at least equally noteworthy. Without a knowledge of the geography of the polar regions, including their hydrography and meteorology, we should still be ignorant of numerous phenomena which influence other parts of the globe. For the world must be studied as a whole, because each region influences surrounding regions, and if large areas remain unknown, even those areas which are known cannot be understood from a scientific point of view. It is the same with every department of science; and magnetism, geology, botany, and biology have all largely benefited from polar research.

But it was not solely from the desire of increasing knowledge and advancing trade and navigation, that the policy of employing our navy on voyages of discovery in time of peace was adopted and continued. Those objects were recognized as sufficient in themselves, but successive

generations of our statesmen also saw the great value of exploring expeditions to the navy itself, for offering opportunities of distinction, for acquiring experience in the exercise of faculties which are of most value to seamen, and for securing active employment out of the stagnating ordinary routine of the service. These I know were the views of the best naval friends of polar research in times past, such men as Sir Henry Hotham and Sir George Cockburn. Remember, too, the words of one who loved the navy dearly, our associate Sherard Osborn. "It is by the action of public opinion," he urged, "directed by the men of science in this country, that I hope to see a polar expedition sent forth under naval auspices. The navy needs some action to wake it up from the canker of prolonged peace. Polar exploration is more wholesome for it, in a moral as well as a sanitary point of view, than any more petty wars with savages. You are not going to educate us, work us up to the point of nautical perfection, awaken hopes and ambitions, and then keep down the aspirations which intellectual progress has evoked. The navy of England cries not for mere war to gratify its desire for honourable employment or fame. There are other achievements, it knows well, as glorious as victorious battles; and a wise ruler and a wise people will be careful to satisfy a craving which is the life-blood of a profession—indeed, I hold that it ought to be fostered and encouraged." Many of us will remember the words of Admiral of the Fleet, Sir Edmund Commerell, himself a brilliant disciple of Sherard Osborn, on the occasion of our Franklin commemoration. He said, "My experience of over fifty years in the service has taught me that you can look nowhere for better officers, in the ordinary run of duty, and better seamen, than in these polar expeditions. We know very well that they have been an excellent school in every way; above all, an excellent school in hardihood." He brought forward Sherard Osborn himself as an example. "He was always forward and untiring in polar expeditions, so when it came to war, there was Osborn in the forefront. I believe, in the future, that polar work will not cease, as I am perfectly certain it is the best school we have for our navy."

Well! with all this evidence of its value and importance before us, it was natural that we should look forward with some confidence to a favourable consideration of our representation to the Government in favour of a naval antarctic expedition. We were, however, disappointed. It was considered that officers could not even be lent, because they might be out of reach of the telegraph if they were required. This is not the opinion of such an authority as Admiral Sir Vesey Hamilton, who was recently first Sea Lord of the Admiralty. "The maritime supremacy of Great Britain must be founded on a quicksand," he said, "if she cannot spare a few officers to enable her to maintain her supremacy in maritime discovery." We might perhaps have waited until this more

truly *naval* opinion prevailed. The additional objection on the ground of expense was received by us last year; and I knew, from experience, that these were not necessarily, or even probably, final replies.

But there were very strong reasons for avoiding further long delays. Chief among them was the fact that a German expedition, amply supplied with funds by the Government, would certainly undertake exploration in the antarctic regions, and that the Germans had invited us to co-operate and act in concert with them. Under such circumstances it would be a disgrace to this country if she held back; resigning her old position in the van of discovery. It was, therefore, resolved to make an appeal for funds to the Fellows of the Society and to the public. That appeal has already met with a noble response from many well-wishers, but far above all from Mr. Longstaff, whose munificent and patriotic action has enabled us to secure the equipment of a small though efficient expedition. It is, however, most important that others should follow this splendid example. For upon the raising of a considerably larger sum depends, not only more adequate arrangements, but also the duration of the exploratory operations for a sufficient time.

The Royal Society and the Royal Geographical Society are working in perfect unison in this matter; and a joint committee, composed of equal numbers of both societies, has been nominated by the respective councils, to conduct all the business connected with the antarctic expedition. There will be sub-committees to consider and deal with the several departments of work. We still hope that there will be assistance from Her Majesty's Government, both as regards leave for officers to serve and as regards a grant of money. For we look to the various precedents afforded by several private expeditions which have occasionally stepped in to perform work which has usually been undertaken by the Government. Among them may be mentioned Back's land journey, the expedition of the Rosses, when the magnetic pole was discovered, M'Clintock's expedition to discover the fate of Franklin, and Sir Allen Young's expeditions. Treasury grants were made to three of these private expeditions; in fact, whenever asked for, assistance in various ways to others, and naval officers were allowed to serve in all. So that the refusal of a supplementary grant or of the services of naval officers would be unprecedented. There is, I am glad to think, every reason to hope that it will remain so.

Hitherto antarctic exploration has been naval work, and there are peculiar difficulties when it is forced upon scientific bodies. It is outside their ordinary duties, and they have necessarily entered upon it with a serious sense of the responsibility it will entail. Yet there was really no alternative, and the Royal Society and Royal Geographical Society, with the warm sympathy of all the other scientific bodies of the empire, have combined to organize and despatch an expedition. It is in no sense a private expedition; its objects are precisely the same as

those of the polar expeditions so often despatched or subsidized by the Government, while its national and representative character are emphasized by the Prince of Wales having become its patron and the Duke of York its vice-patron. I cannot conclude my address without warmly thanking the subscribers among the Fellows, and representing to those who have not yet subscribed how much the credit not only of the Society, but of the country, is involved in the provision of adequate funds for this great national enterprise.

EXPLORATIONS IN THE BOLIVIAN ANDES.*

By Sir MARTIN CONWAY.

BEFORE proceeding to describe in briefest outline the results of my expedition to the Andes in 1898, let me express in the most emphatic manner my thanks to the Governments of Bolivia, Peru, and Chile, for the facilities they placed in my way. Armed with the kind recommendation of Señor Aramayo, the able Bolivian minister to this country, I was received by his fellow-countrymen with open arms, and all ways were made for me as smooth as it was possible to make them. Our honorary Fellow, Señor M. V. Ballivian, was my good genius in La Paz, where, moreover, in the much-to-be-regretted absence of any British diplomatic representative, I was kindly protected by the French *Chargé d'affaires*, M. de Coutouly, and the United States minister, Dr. Bridgman. The Peruvian Government admitted my baggage free of duty; whilst the Chilian Government placed at my disposal in the Straits of Magellan a steamer, which enabled me to make the explorations I desired. To our own diplomatic representatives, Mr. Gosling at Valparaiso and Mr. St. John at Lima, I owe very hearty thanks for their great kindness; whilst at Punta Arenas Mr. Meredith, our vice-consul, extended to me a warm hospitality, and gave me valuable help.

Accompanied by two Alpine guides, Antoine Maquignaz and Louis Pellissier, I left Southampton early in July, and voyaged by the Royal Mail steamer to Colon; crossed the isthmus of Panama, spending a week in that neighbourhood; then sailed down the west coast of South America to Callao, where I took the opportunity of a four days' halt to mount by the Oroya railway to the crest of the Andes, and obtain a glimpse of the snowy range in the neighbourhood of the pass. From Callao I proceeded to Mollendo, and so by way of the Arequipa railroad to Lake Titicaca, that remarkable sheet of water fourteen times the size of the lake of Geneva and 12,600 feet above the sea, which is to be regarded merely as a remnant of a far greater inland sea now shrunk away. A steamboat took us down the lake, a voyage of 111 miles, on

* Read at the Royal Geographical Society, May 8, 1899. Map, p. 128.

a brilliantly clear and beautiful day. We passed the historic islands from which the Inca civilization is reported to have spread, and we saw the noble Mount Sorata rising in white splendour apparently from the waves. At Chililaya we transferred ourselves to a four-horse vehicle, locally known as a tilbury, and drove to La Paz by a good road which traverses the high level plateau called the Puna. During this drive of some 30 miles we were passing below the feet of the wonderfully straight range of snowy mountains called the Cordillera Real, whereof Mount Sorata forms the northern extremity, and Illimani, 64 miles away, the southern. It was this range that I had specially come to visit. I do not propose to give a merely chronological account of our doings during the four months we spent in this part of Bolivia. A concise statement of the general results of our work will probably be more interesting to this Society. I may remark that I triangulated the principal peaks of the range from Sorata to Illimani, and made a plane-table sketch survey of their western slope, and of the Puna and the valley of La Paz. But this map cannot be published at the same time as my paper, seeing that I hope to be able to correct and add to it by a second visit to the country.

The Cordillera Real is the backbone of Bolivia. To the east the mountains fall very rapidly to a low hill country and the fertile valleys which send their waters to the river Beni. I unfortunately saw little of this side of the range, and it is thither I hope to return. On the other side there lies the high plateau of which I have spoken, at a uniform altitude of 12,000 to 13,000 feet, from which the tops of low rocky hills here and there emerge. That this plateau was at one time submerged is obvious enough. The slopes that lead down to it from the main Cordillera are covered with immense accumulations of glacier-borne and water-rolled *débris*, the ruins of the range against which they lie. Evidence is plentiful that in ancient times the glaciers enveloped a large part of these slopes, and reached down many miles further than they now do, depositing the rocks that they carried into the waters of the ancient sea. What the limits of this glacier extension may have been, it is difficult now to estimate, for there are proofs that the glacier-deposited *débris* have been much torn about and rearranged by water. But a very minute examination would have to be made before the exact extent of this process could be estimated. In the immense pile of *débris* deep valleys were afterwards cut by the action of water, and into these valleys the glaciers in a second period of advance protruded their snouts, depositing moraines which can still be traced *in situ* as much as 4 or even 5 miles below the present limit of ice. One such glacier-cast was carefully examined by me near the foot of Mount Sorata. The terminal moraine now forms the dam of a large lake, 500 feet above the level of whose waters the two lateral moraines can be traced with perfect distinctness. At the north-west foot of the

same mountain, where the mule-track goes over from the Puna to Sorata town, the whole area is glacier-worn and encumbered with moraines; whilst in the deep Maperi valley, whose head lies against the north face of Mount Sorata—a valley now absolutely devoid of ice, and occupied up to the very foot of the mountain with almost tropical vegetation—the marks of glacier-action are of the most striking character. These are merely examples amongst the many that might be quoted from different parts of the range.

The climate of the plateau region is of importance in connection with its present physical formation. A great part of the year is completely rainless, but from the beginning of December till the end of March or April rain is precipitated very frequently and with great violence. During the remainder of the year the slopes and plains are swept by dry winds, and sometimes scorched by a very hot sun, so that, except at very high levels of perpetual snow, where bad weather lasts over a longer period, the surface of the whole country is dried and baked. In the rainy season mud avalanches fall down the slopes, gullies are deepened, every stream is in flood, waterways are ploughed in various directions in the plain, and all the rivers eat their way back. The great dryness of the land, when the rain begins, facilitates the rapid action of denudation, so that surface-modelling by water is perhaps as vigorously carried on here as it is in any part of the world.

That this is no modern development is proved by an examination of the range as a whole, for it is cut through, or is being cut through, at its two ends by profound excavations, and, curiously enough, that happens here which is also a characteristic of the Kara Koram Himalayas—the gaps are deepest close to the highest summits. Thus, just south of Illimani, a tributary of the Beni river has eaten its way back and back, and finally has cut clean through the Cordillera, so that now the streams that rise on the west slopes of all the southern half of the Cordillera Real, uniting in the La Paz river, actually flow across the Cordillera, through the deep gorge thus eaten back, and empty their waters into the Beni, the Amazon, and the Atlantic. A similar process is going on north of Mount Sorata, where the Maperi river has already got halfway through the range, and is now busily engaged in eating backwards at its head, so that in no long geological period it will cut back to Lake Titicaca, and will ultimately empty that out, likewise, into the Amazon and the Atlantic. All that remains now for it to pierce is the relatively low ridge over which the road to Sorata Town passes, and its crest is less than 2000 feet above the level of the lake, while the distance from Achacache, which is on the margin of the lake, to the pass is perhaps some half-dozen miles. More striking examples of the eating-back action of rivers it would be difficult to find.

In a former paper read by me before this Society, I pointed out how there are indications in Spitsbergen of glaciers eating back at their

heads, just as rivers do; and I suggested that the agency of glaciers was probably that which causes the penetration of ranges of mountains to happen so frequently in the immediate neighbourhood of their highest peaks. Whether the mountain ridge south of Illimani and the other north of Sorata were broken down by the backward eating of glaciers, or whether it is water-action that destroyed them, is of course not easy to assert; but upon Illimani I observed a glacier at the present moment eating its way back through a secondary ridge in a manner that could not possibly be misinterpreted. The ridge that was giving way formed the right-hand support of a considerable glacier. The side of

A BALSA ON LAKE TITICACA.

this ridge remote from this upper glacier forms a cliff, at the foot of which there is a lower glacier, and the lower glacier, by continually carrying away the *débris* split by frost and sunshine from this face, causes the face to retreat into the mountain. The process continually going on has breached the ridge itself at one point down to the level of the glacier supported by it, and now the ice which formerly would have flowed down the upper glacier, is just beginning to break away and tumble over the cliff to the lower one. Allow this process to go forward for a short time, and the whole configuration of the mountain will be changed.

It seems to have been the general impression that, though the

western flank of the Cordillera Real consisted of Silurian rock, the peaks of the range were of volcanic formation, and I have often seen Sorata and Illimani referred to as extinct volcanoes. As the result of a careful examination, not only of those peaks, but of the *débris* brought down by the glaciers all along the range, I have been unable to find any trace of volcanic action along the axis of the range. The Cordillera Real has been elevated by a great earth-movement, and the heart of the range consists of granites, schists, and rocks of that description, which Prof. Bonney has kindly undertaken to examine and describe. A transverse section across the range would reveal a central block of such rocks cloven by almost vertical pressure-planes flanked, to the west by Palæozoic, probably Silurian, slates and grits, with which some compact igneous rocks, not belonging to the later volcanic group, seem to be associated. These dip steeply towards the Puna. Further out come beds of red sandstone and conglomerate dipping less steeply. Such, in broad outline, is the comparatively simple general structure of the mountains.

The whole range may be described as rich in mineral products, but of the distribution of these I cannot at present say much. Gold is found at several points, but the chief gold-bearing valleys are those on the east side of the range, and more especially the Tipuani and Coroico valleys. Gold is found in the La Paz river after every rainy season, whilst very rich gold-washings are being worked in a valley whose waters come from the flanks of Mururata. Just below the snowy mass of Cacaaca on the west, there is a really enormous vein of tin, which is being worked by a French company; whilst antimony, cobalt, and, I believe, platinum, have been found in different parts. The great copper deposits are not in this range, but further to the west, especially about the town of Corocoro.

The Cordillera Real between Sorata and Illimani divides itself into two fairly well-marked parts. The point of division is Mount Cacaaca, which stands almost exactly midway between the two terminal peaks, and is third in altitude of the whole group. Between Sorata and Cacaaca there runs an almost continuous series of snowy peaks, some of them sharp in outline; but the range for the most part has been much worn down by denuding action, and the individual mountains have thus been brought to a form very similar to that of the snowy Alps. Almost every one of the mountains reminded me and my Alpine guides of some peak or another familiar to us in Switzerland, so that in conversation we used to talk of one peak as the Rothhorn, of another as the Dent Blanche, etc. The passes in this part of the range seldom sink below the snow-level, though there is certainly one, and there may be two passes, a little north of Cacaaca, which are free of snow in the summer. South of Cacaaca the range is much less continuously lofty. There are three or four big groups of snow-peaks, but between them

are broad stretches where the range does not rise to the level of perpetual snow, and over these lie passes, some of which may be traversed by mules, whereby La Paz is connected with the fertile region of Yungas. Indeed, I understand that there is a proposal to make a railway over one of these passes, and that the physical difficulties to be surmounted, though of course considerable, are by no means prohibitive. I approached several of the passes over the range, but did not actually cross any of them, and therefore cannot describe them. Suffice it to say that it would be quite easy to make good routes for mule traffic across the range at several points, and that such routes, communicating

MOUNT SORATA, FROM THE PUNA.

with the rich country to the east, would materially develop the wealth of the country.

South of the great gap, by which the La Paz river traverses the ancient watershed, the main range is continued, though at a much lower altitude, There is one attractive group of snow-peaks called "The Five Crosses," but they rise very gradually from the high region about them, and it is only their actual summits that are at all steep. They have been ascended more than once, for the most part by persons prospecting for minerals, and certain mineral deposits of a promising nature have been found in their slopes, though not, I believe, towards their summits. We made no attempt to penetrate into this portion of

the range, though I had good views of it from the flanks of Illimani and from the plain to the eastward.

The flora of the high regions of the Cordillera Real appeared to us very sparse, though it is only fair to say that the rainy season must be the time when the flowers are most numerous, and as we quitted the country before the actual commencement of the rains, we probably only encountered the earlier flowers; of their general character I do not propose to speak, for they have been investigated at Kew Gardens, and the results will find their proper place for publication elsewhere. Suffice it now to say that the flowers we found were much scattered about, one here, another there, but that we never came across any carpet of blossoms such as form the great attraction of many high mountain regions. Bird-life was more prolific. Leaving the Puna and the lake out of account, where birds have formed the subject of independent investigation by experienced observers, it may be said that up to an altitude of 17,000 feet, in suitable places, birds were numerous, and in a little tarn close to our base camp on Mount Sorata, at 16,000 feet above the sea, we shot geese, gulls, wild duck, and snipe, besides several small birds; and we saw a number of rather large green-headed humming-birds, of which, unfortunately, I was unable to secure specimens through lack of suitably loaded cartridges. The slopes of broken rocks beside this place were haunted by multitudes of bizcachas, which seemed to thrive exceedingly. Chinchillas we did not see, but from scraps of fur I picked up, it seemed possible that they also might have been found in the same neighbourhood.

Except at La Paz and Sorata Town, the inhabitants of the Puna and the banks of Lake Titicaca were almost entirely Aymara Indians. By them the Puna is densely populated. They cultivate almost every yard of it by their primitive methods during the rainy season, and they obtain tolerable crops of cevada and potatoes. Potatoes, in fact, are one of the chief articles of food that the country produces. There are many varieties cultivated, and they are afterwards prepared for food in a multitude of ways, so that potatoes for food are met with in over a hundred different kinds. Some are put out at night to freeze, and taken in before the morning sun brings on a thaw; some, on the other hand, are dried in the sun and taken in at night to be sheltered from the frost; some are wetted and frozen, and some are dried and frozen, and there are multitudes of other modes for preparing potatoes for the market. The Indians are practically attached to the soil for the most part, and hold their lands by a kind of feudal tenure. Instead of paying a rent, they give their labour to the landlord, cultivating his fields as well as their own, but only according to their traditional systems of agriculture, by which a field is cultivated once in four years and lies fallow for the remainder of the time, whilst at the highest levels of cultivation the turn of a field comes even less frequently.

So long as no attempt is made to interfere with their traditional modes of life, and they are not oppressed by the landlords or their administrators, the Indians are quiet enough; but they are never well disposed to white men, and the difficulty of keeping them in order is not slight. Bolivia does not possess a large military force or an organized body of country police, for the area to be policed is large, and the white population is very small. Thus the Indians are kept in order more by management than by force, and the great agency of control is not the police, but the priests. The Indians are an exceedingly bigoted folk, retaining under a mask of Christianity their ancient superstitions, little altered. I was seriously interfered with in the prosecution of my

MOUNT CACAACA, FROM NEAR MILLUNI MINE.

researches by Indians, because the nature of my undertaking involved some outrage to their superstitions. Like all semi-civilized mountain folk, they regard the mountains above the level of habitation as a part of the other world, the world of divine and diabolic beings, and the haunt, I believe, of the departed. It was firmly held by the Indians of the Puna, and especially of that part of it which lay round the base of Mount Sorata, that on the summit of one of its peaks there stands a great golden bull and a golden cross, planted by supernatural agency. They considered that the object of my expedition could be nothing else than to obtain possession of these priceless treasures. For this reason partly, and partly through the hostility of the Indians of a neighbouring

village to those of the village whence the porters who accompanied me to the base of the mountains were recruited, my camp at the foot of Mount Sorata was raided one night, and if we had happened to be in at the time, things might have gone hardly with us. As it was, we were then encamped in our small tents among the snow, and the snowy areas are not visited by the natives.

Again, during the progress of my triangulation, it was essential for me to spend some time on the top of a hill that rises out of the Puna in the neighbourhood of a village of particularly bigoted Indians. On this hilltop there stands a *chulpa*, a little building probably enough of pre-Spanish date, which now would be called a chapel, but is really the funeral monument of some departed chieftain. All the lower and more accessible hilltops in this part of Bolivia are surmounted by such chulpas, and the natives greatly dislike their profanation by the visits of strangers. At all events, I had no sooner set up my theodolite near the *chulpa*, than the Indians began collecting from all quarters, till I was surrounded by more than two hundred enraged natives. I was alone at the time with one half-breed muleteer, and it was only by the skin of my teeth that I ultimately escaped, abandoning in the hands of the Indians the theodolite, which I fortunately had just time to pack up in its box, and riding away pursued by a stone-throwing and howling mob. I found that they could run almost as fast as my indifferent mule could gallop, and the four miles' chase that ensued before I got within the walls of the town of Achacache was not the least exciting adventure I had in Bolivia. It was necessary to return again to this point to conclude my observations, and, though I went back accompanied by persons having influence with the Indians, I was only just able to complete my work and get down from the hill before the stone-throwing began once more. Attempting to continue the survey on the following day, I found the whole country risen against me; it became necessary to obtain the assistance of a company of soldiers before I could complete my task. These Bolivian soldiers, with whom I spent several days, were an admirable set of fellows, very strong, good tempered, and the best marchers I ever saw. They kept up a kind of trot for hours together across the roughest kind of ground, each man heavily laden, and under burning sunshine. But there seemed no limit to their powers of endurance, and there is little doubt that with good leading they would make formidable troops.

Of the antiquities of Lake Titicaca and the neighbouring plateau I need not here speak, for the important ruins—those on the island of Titicaca and the neighbouring island of Coati, and the famous megalithic monuments at Tiahuanaco—are well known, whilst the chulpas and the ruined villages and ancient burying-places of the prehistoric natives are now being most carefully excavated and investigated for the Washington Museum by Mr. Bandelier and his wife. It is impossible to overpraise

the work of Mr. Bandelier, whom I may best describe as the Flinders Petrie of ancient Peru. Not only does he dig into the ground, but he makes researches equally important into the minds of the living folk; he is thus slowly accumulating a mass of material of the highest interest alike to anthropologists and historians. When I met him, he was engaged in excavating the burial-place and the ruined houses of a village planted high up on the slopes of Illimani. Indeed, there are indications of prehistoric habitation and agriculture on Illimani at a very much higher level than the villages of the present day. One such ruined village was planted at the very edge of a small glacier, and was

EARTH-PYRAMIDS IN LA PAZ VALLEY.

only reached by a footpath, difficult and even dangerous to traverse. In the burial-places of this ancient peasantry were, of course, found no treasures of silver and gold, but only simple pottery and a bronze pin or two, besides some stones of peculiar shape, which the existing Indians, who helped in the excavation, instantly recognized as fetiches. The second time I met Mr. Bandelier, he had been digging a ruined village of more prosperous character near the town of Sicasica. The mud huts were still standing, in many cases retaining their mud roofs, and each with its little doorway towards the east. Beneath the floor of those huts were buried generations of their bygone inhabitants, just

as Prof. Petrie found in the Egyptian village of Kahun and elsewhere. The skulls of all the adult natives presented the characteristic of a very retreating forehead, artificially produced in childhood, but one interment fortunately yielded the skull of an infant in perfect preservation, whose form, unaltered by artificial means, was proof that the peculiarity of the others was not natural, but artificial.

If the Cordillera Real shows slight traces of volcanic activity, the outer or coast Cordillera shows plenty. Standing high upon the slopes

GORGE NEAR CUSANACO MINE.

of Illimani or of Sorata, we could always see, away to the westward, mountains of unmistakable volcanic type. Indeed, in coming from Mollendo to Lake Titicaca, we passed round the base of the large and famous Misti, which rises to a height of 19,000 feet. On its summit the observatory of Harvard College established at Arequipa has a station, fitted with self-recording meteorological instruments, and every fortnight a man goes up to bring down their records. Further to the south, and along a line parallel with the Cordillera Real, other

volcanoes may be observed at frequent intervals. It was my intention to visit Sajama, and if possible climb it on my way down towards the sea; but the difficulty of getting together a caravan proved too great, and I was reluctantly obliged to relinquish the plan. Sajama is nearly the highest of a group of extinct craters which would well repay careful examination. Further south along the line of the railway that descends from Oruro to Antofagasta, volcanoes are frequently met with. In fact, the whole country is rich in the signs of volcanic activity. Two smoking volcanoes are passed by the train. At one point the line is taken by a cutting actually through a stream of lava, which looks as

ILLIMANI, FROM NEAR CAIMBAYA.

though it had been quite recently erupted, so sharp are its outlines, as it lies upon the desert slope. It resembled to my eyes nothing so much as the tongue of a great stone-covered glacier. The whole of this region from Oruro to the sea, with the exception of a few areas artificially irrigated, is an appalling desert, not valueless by any means, for in great hollows of the ground there are white borax deposits that look like lakes frozen over and covered with snow. The mineral wealth of the mountains is undoubtedly considerable. This region has, I believe, been fairly well prospected for minerals, but geographically it stands in need of, and would well repay, a careful examination. In point of scenery it resembles nothing so much as a landscape on the moon,

whilst for weird beauty and strangeness it can find, even in the midst of the Sahara, no superior and few rivals upon the face of the Earth.

After leaving Bolivia, I spent a few days in making the ascent of Aconcagua.* It was not, of course, a first ascent of that fine mountain, for, as everybody knows, it was ascended by Mr. Vines and my old Himalaya guide Zurbriggen, members of Mr. E. A. Fitz Gerald's expeditions in 1897. Mr. Fitz Gerald was an old friend of mine. I had followed his proceedings with the deepest interest, read all he had written on the subject, and conversed with him about the mountain before leaving home. He had urged me to make the ascent, and had given me all the information possible to facilitate it. My ascent of Aconcagua was not a scientific, but a merely sporting expedition. The mountain had been measured by Fitz Gerald with greater accuracy and care than almost any other high mountain in the world has ever been measured. He had also fixed its position astronomically with great exactitude, and had mapped the peak and its neighbourhood most beautifully. When his book comes out, the public will learn, as they do not yet know, how excellent was the work done by Mr. Fitz Gerald's party. When I returned from my ascent, after only ten days' absence from Valparaiso, the opinion of

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* Left Valparaiso December 1; crossed the Andes to Baths of Inca, December 2. December 3, rode up Horcones valley and camped at the head of it, about half a mile below Fitz Gerald's 14,000-feet camp. December 4, sent baggage up to site of Fitz Gerald's 16,000-feet camp. December 5, ascended to 16,000-feet camp. December 6, ascended to about 18,500 feet, and camped near the south edge of the great north-western slope of screes. We thought this was Fitz Gerald's top camping-place, because we found an old duster there, but it must have been brought by wind. December 7, started at 3.30 a.m. up the screes, following thence forward a line of ascent different from Fitz Gerald's. At 7 a.m. Pellissier turned back ill. Between 9 and 10 a.m. reached foot of second or third gully (counting from north-east to south-west) in the highest rock-wall. Climbed this gully to the summit ridge, which was struck between the highest peak and the lowest point in the summit ridge. Turned to the left (north-east) along the narrow snow *arête* towards the highest point, and climbed over several undulations to the top of a peak near, and not many feet lower than, the highest peak. It was then about noon.

There was absolutely no difficulty between this point and the highest peak, though the ridge thus far had not been easy. All difficulties being thus overcome, and the ascent not being a first ascent, I decided to descend, for two reasons: (*a*) because it was advisable to get back to Pellissier as quickly as possible: (*b*) because Vines, when he ascended Aconcagua, made a record for altitude, and I thought it likely that, if I reached his peak, I should be accused of mere jealousy, whereas if, after overcoming all the difficulties of the mountain and being within ten minutes of, and at the very outside 50 feet below the highest point, I turned back, I could not be so accused.

At noon exactly we turned back and went down the way we had come. Reached top camp in two and a half hours. Found Pellissier badly frost-bitten, and realized that it was essential to get him down to mule-level at once. Descended with all baggage in forty minutes to middle camp; packed that up, and descended in forty minutes to foot of slope, fifteen minutes to Fitz Gerald's 14,000-feet camp, fifteen minutes to our base camp, which was reached at 6 p.m. December 8, descended with all baggage to Inca. December 9, sent off baggage for Valparaiso. December 10, started at 5 a.m., crossed the Cordillera, and reached Valparaiso at 11 p.m.

uninformed persons was that I had in some fashion surpassed the exploits of my predecessors, who spent seven months or more on or about the mountain. To begin with, had they not preceded me, I should probably have wasted the best part of a month in searching for the way, which is by no means obvious. Again, the time actually spent by them on the ascent was little longer than that taken by me. Each of their camps was a well-fitted observatory; at each they made long series of observations. The mere determination of the position of the Inca Hotel, from which they started, as I did, took them a month or more. They

ILLIMANI AND THE PICO DEL INDIO.

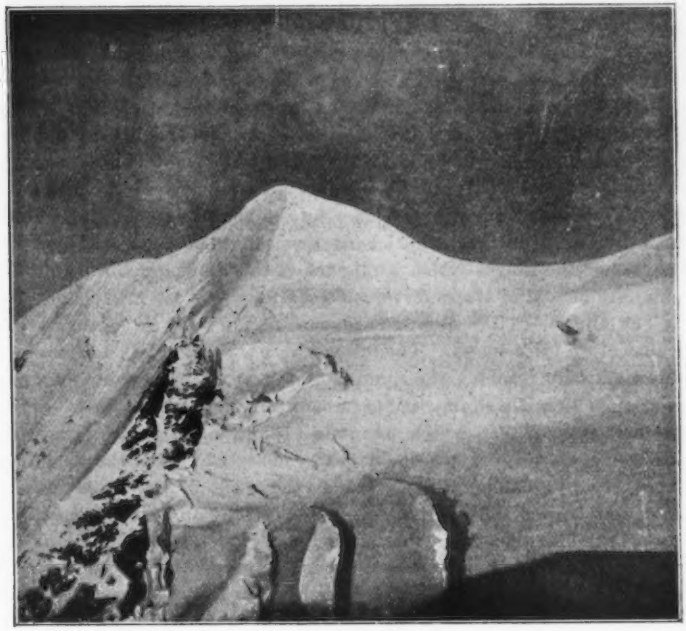
made a complete examination of the geology and natural history of the neighbourhood. Thus my climb cannot be compared with their expedition in any way, and I am the last to desire any comparison between the two to be made. If, hereafter, the summit of Mount Sorata is attained by some more lucky climber than I was, he will owe to me the same recognition that I gladly render to Fitz Gerald.

After returning from the ascent of Aconcagua, I took ship at the southern extremity of the Chilian railroads to Lota, the famous copper and coal mine centre. Passing southward along the west coast in the steamer, we entered Smyth's sound at the Gulf of Peñas. A few days

were spent in the sound, where I was, fortunately, enabled to land at several points and make short expeditions into the neighbouring mountains, and then by the Straits of Magellan I came to Sandy Point, where I halted for a few weeks. During that time, by the kindness of the Chilian Government, a steamboat was placed at my disposal, and I was enabled to attempt the ascent of Mount Sarmiento, the highest and finest mountain in the Fuegian district. I also made an expedition over the Patagonian Pampa to some of the secluded inland waters that long ago attracted me when I first studied them on the Admiralty chart. To this part of my expedition I can only now briefly refer. The character of the scenery of Smyth's sound closely resembles that of the inland passage along the coast of Norway. In both cases, the mountains are formed of hard rocks, granites, schists, and the like; in both these rocks have been polished for long periods by an ice-sheet, which has rounded the valleys and the summits and apparently enveloped the whole range; in both cases the mountains have passed through periods of elevation above the sea, and then of depression into it; in both cases they have been depressed in the more recent period, so that the valley-bottoms are sometimes as much as 1000 feet below the level of the sea; and in both cases this period of depression seems now to be passing away, and the land is being raised once more above the waters. Smyth's sound enjoys a higher reputation for beauty of scenery, but this reputation is, I think, greater than it deserves. Certainly, in point of beauty, the Norwegian inland passage is its superior. Smyth's sound lacks variety of scenery. At one or two points, indeed, there are specially fine views—as, for instance, below the fine promontory named Bold head, or where Trinidad channel opens to the west, disclosing a multitude of beautiful islands, or beneath the snow-clad Cordillera Sarmiento (not to be confused with Mount Sarmiento of Tierra del Fuego), or where the majestic mass of Mount Burney rises by the channel. But in a general way there is a dead level of scenery, fine indeed, but not of surpassing grandeur.

The characteristic of the views is the dense forest which covers the lower slopes of all the hills and islands—a primæval forest of stunted trees, rising out of the ruins of their predecessors, which are rotting and tangled together on the ground, thickly overgrown by moss, offering to the traveller every possible impediment. Higher up, in situations naturally well drained, the forest is more open, and there are occasional bogs occupying the sites of former ponds or lakes, and barren areas of polished rock too steep for earth to collect upon; whilst the tops of the hills are sometimes faced by precipices, and are themselves often relatively bare of vegetation when they do not reach to the level of perpetual snow. Looking inland up the numerous channels which open out from the sound in succession, one often beholds snowy areas, great gathering-grounds of snow, drained by glacier tongues which sometimes terminate in the water. If it were not for the bad weather that infests

this flank of the submerged mountain area, these regions would offer a fascinating subject for a mountain explorer. As it is, I fear they are not likely to attract minute investigation until the more agreeable mountains of the world have been better explored than they are now. The western arm of the Strait of Magellan offers far more splendid scenery to the contemplation of the voyager than does any except the southernmost part of Smyth's sound, but this has been so frequently described that I need not pause upon it now.



TOP OF ILLIMANI, FROM THE PICO DEL INDIO.

I was surprised to find how splendid are the mountains of Tierra del Fuego, which culminate in Mount Sarmiento. It is not that they are actually high, reckoned from sea-level, for Sarmiento is only a little over 7000 feet, but they are so unusually fine in form, and are draped by such magnificent glaciers. The actual height of a mountain, as measured from the sea, is not a true test of its size. Mount Sorata, for example, really begins at 13,000 feet; all that is below, it possesses in common with the great tableland on which it stands, and it is not till about 16,000 feet that the actual peak begins. Illimani, on the other hand, stretches its slopes down to the very depths of the valley

of La Paz on the one side, and to the lowlands of Yungas on the other, so that it is seen from base to summit—a mighty mass, whose top is at least 17,000 feet above its foot. Mount Blanc is practically a mountain no more than 10,000 feet high, though its summit is nearly 16,000 feet above sea-level; while if the Alps were sunk into the sea till all that part of them were submerged which may be traversed without real climbing, there is hardly a peak that would rise 5000 feet above the surface of the waters. Mount Hedgehog, in Spitsbergen, is only about 5000 feet in height, but every one of those 5000 feet has to be climbed, and, as a problem for the climber, Mount Hedgehog is more difficult than most Alpine peaks. The 7000 feet of Mount Sarmiento are all difficult of ascent, and the climb may be said to begin near the very level of the sea, so that the snowy mass of Sarmiento is larger than that of Mount Blanc, and almost as large as that of Mount Sorata. Here again we were under the impression that we should find traces of volcanic action, but we found none. Mount Sarmiento, and the range of which it forms a part, has been upheaved by a great earth-movement, and carved out from a vaster mass by the action of denuding forces. Much further t the eastward I believe volcanoes do exist on Tierra del Fuego, but the ranges which border the Cockburn channel or Admiralty sound are devoid of traces of volcanic action.

The climate of the Mount Sarmiento region is by no means so bad as that of Smyth's sound. Though we were unfortunately driven down before actually reaching the summit of the peak, by a storm of great violence, which it was impossible to maintain ourselves against, I think that here is an area in which mountain exploration might be carried on with some prospect of reasonable enjoyment, and with the certainty of obtaining valuable results. The arrangement of the ridges, except those that border Beagle channel, is not yet by any means clear. A great part of the island of Tierra del Fuego which is marked blank on the map, is occupied by mountains, whilst the glacier development is considerable. An examination of these glaciers led me to conclude that, in character, they must be placed between the truly arctic glaciers, such as we saw in Spitsbergen, and those of temperate regions. They have much of the apparently greater viscosity of arctic glaciers, pouring down their slopes and bulging at their snouts very differently from the glaciers of the Alps. The most remarkable glacial feature that we saw was a rocky basin of great extent, just at the foot of the north slope of Mount Sarmiento, filled by the great supply of *névé* that comes down that slope, and overflowing in three different directions, to east and west and north, where three separate tongues of ice find their way almost into the sea. One of them, by which we mounted, is only separated from the sea by a narrow belt of forest-clad moraine, and it is evident that, not so long ago, the snout of the glacier must actually have reached the water. But, as I explained in connection with the glaciers of

Spitsbergen, a glacier ending in shallow sea must sooner or later build in front of its snout a wall of moraine, which must ultimately cut it off from the water. Such moraine walls, dividing glacial snouts from the sea, were found by us in several places in the neighbourhood of the Sarmiento range. Our examination of this district was of course very cursory, but to me it is intensely interesting, and I hope that, before many years, some better-equipped mountaineer will find himself in those parts, and will devote a whole season to the exploration of the glaciers. Sandy Point is now developing into a town of considerable importance, where all necessary commodities can be obtained, and where, at the right season, a traveller would be able to hire boats and engage companions.

Before the reading of the paper, the PRESIDENT said: This evening we have the pleasure of welcoming here again Sir Martin Conway, who has given us so much interesting information in regard to such distant parts of the world as the Himalayas and Spitsbergen. Now we are to hear from him some of the results of his very interesting journey to South America.

After the reading of the paper, the following discussion took place :—

Señor ARAMAYO, the Bolivian Minister: A few nights ago, under this same roof, I had the pleasure of congratulating Sir Martin Conway on the wonderful success of his ascents of the highest peaks of the Andes, and of thanking him, as I do now again, for the most complimentary manner in which he has referred to my country and to myself. I am sure that his lectures will have a great part in bringing Bolivia into closer connection with the scientific and commercial world, and he may be assured of the esteem and gratitude of my fellow-citizens. I thank you, Mr. President, for giving me the opportunity of acknowledging our indebtedness to Sir Martin Conway, and I take this opportunity of congratulating the Society on this addition to their succession of triumphs in the cause of science.

Prof. BONNEY: I am sorry to say that since I received Sir Martin Conway's rocks I have only been able to afford the time to give them a cursory examination, but I have seen enough to perceive that he has settled one question which, up to the present time, was a matter of doubt. Various statements have been made as to what was really the nature of the Cordillera. David Forbes, in his excellent paper to the Geological Society, stated that the summit of Illimani consisted of Silurian rock. d'Orbigny said it was granitic. Now, ascending from the eastern slopes you pass a series of slates and schists, probably of Devonian and Silurian age. Above that, from the highest parts of the mountains, Sir Martin Conway has brought a series very difficult to decide upon without microscopic examination. Some are of igneous origin, but quite different from those generally found in the Andes. The Pico de Paris is a fine banded gneiss, and the Pico del Indico is of coarse granite. In the same way, Sorata consists of a series of crystalline rocks, such as you might get from the central part of the Alps. It is remarkable that the volcanic rock of the Andes is almost wholly confined to the western series of mountains. Only from one place on the lower slope of Illimani has Sir Martin brought one of the typical Andes rocks, such as have come from Aconcagua, and as Mr. Whymper has brought from the Ecuadorian Andes. The physical structure is remarkable. The crystalline rocks form the most eastern of the ranges, and it is worth noticing that the only rocks of that type were brought by Mr. Whymper from the most eastern peak of the Andes he visited in the Ecuadorian region. The origin of those gaps in

the chain is very interesting. I doubt if the case is parallel to that afforded by the Himalayas and Karakoram and by the two principal ranges in the Alps, because in both these cases we have rivers rising well behind a range, which they cut through, while here we have rivers cutting back into the plateau; that is to say, the plateau in these Ecuadorian regions is clearly a much more ancient feature than the river; while in the other two cases the rivers have always flowed in the same way, and cut down the land as it rose. It would be interesting to make out what the real history of these gaps is.

There is one more remarkable point in this region—that there is such a mass of snow and glacier. It is singular that in Aconcagua, some 1400 feet higher and 16° further from the equator, there is much less snow—Sir Martin Conway and Mr. Fitz Gerald's party, in ascending, found little snow on Aconcagua—yet here in the Cordillera are masses of snow and glacier that would do credit to the Alps. I conclude the precipitation in this district must be greater than that of the Andes further to the south. I think we may congratulate Sir Martin Conway on the extremely interesting results that have attended his exertions, and I hope we may be able to make some considerable additions to the geology of this region.

Dr. H. Woodward: I am asked by my colleagues in the British Museum to say a word about Sir Martin Conway's collections. He did not merely climb the Andes, but he has collected natural history specimens all along his route. Besides the rocks which Prof. Bonney received, there were some interesting minerals, which Mr. Fletcher has casually examined. Among these are two rare species of angelite; the former contains the rare chemical element germanium, and the latter a hydrated phosphate of aluminium. Dr. Bowdler Sharpe has received an important collection of birds, and although no species is new, some important new localities are represented, and at higher altitudes than specimens hitherto obtained. Among the insects, of which a large collection is waiting to be examined, at least there is a new Meloë, one of the curious oil-beetles, closely allied to a species obtained by Mr. Whymper at an elevation of 10,000 feet in Ecuador. From the casual examination of the specimens already made, we know that important additions will have been made to the Natural History Collections by Sir Martin Conway, and I congratulate him on the successful results of his journey.

The following communication on the botany of Sir Martin Conway's expedition was read on behalf of Mr. W. Botting Hemsley, keeper of the Kew Herbarium:—

The botanical collection made by Sir Martin Conway is almost entirely restricted to the plants found at the extreme upper limits of vegetation, and numbers only about sixty-five species. But it is an exceedingly interesting collection, and will be the subject of a paper to be read before the Linnæan Society on June 1. There are apparently no authentic published records of plants growing in the Andes at a greater elevation than about 17,000 feet. Humboldt cites only two plants—a gentian and a lobelia—growing on Chimborazo at an elevation of 15,973 feet. Subsequently, Brongniart published a saxifrage, *Saxifraga Boussingaulti*, from the same peak, discovered at an elevation of 16,236 feet. This was supposed at the time to be the highest point at which a flowering plant had been found in the Andes. Curiously enough, so far as we know, this plant has not been collected by any traveller except the one whose name it commemorates. In the Kew Herbarium are several plants from the Andes labelled as having been found at altitudes of 17,000 to 18,000 feet; but these records are probably not quite exact. The district visited by Sir Martin Conway had been previously very thoroughly botanized by Weddell, Mandon, and others, and the first-named botanist's 'Chloris Andina' is the most important work in existence on the flora of the Andes. The author records only eight species of flowering plants from a greater elevation than

5000 metres (16,400 feet), and only one definitely from so great an elevation as 5200 metres (17,056 feet); though he has been falsely cited as recording a composite (*Culcitium canescens*) from an elevation of 5900 metres, or 19,352 feet. Sir Martin Conway's collection contains at least half a dozen species of flowering plants from elevations of 18,000 feet and upwards, the highest being from about 18,500. They include a saxifrage, a mallow, a valerian, and several plants of the natural order Compositæ. It is noteworthy, in this connection, that members of the same natural order attain the upper limit of phanerogamous vegetation in Tibet, where, in lat. 30° to 34°, one was found by Dr. Thorold at 19,000 feet. Sir Martin Conway's collection has not been thoroughly worked out yet, but it probably contains no previously unknown species. It is, however, none the less interesting, and botanists are greatly indebted to him for the trouble he took in forming it.

Colonel CHURCH: I think the evening is getting on, but I might say a few words with reference to Sir Martin Conway's paper. I have listened to it with great pleasure, for he travelled over a great deal of ground which I myself visited. I know of no grander sight along the line of the Andes than the Cordillera which is flanked on the north by Illampu, and on the south by Illimani; you have a line of snow-peaks above 100 miles in extent, and these viewed from the coast ridge, looking eastward across the Titicaca plateau, form a mountain range which perhaps has no equal in beauty in the world. That plateau of Titicaca is merely the alluvium and detritus from the great Silurian Cordillera which I have just mentioned; it has a thickness of from 2000 to 2500 feet, and through this the La Paz river has carved its way. I am disposed to differ from Sir Martin as regards the La Paz river cutting back from the Amazon side of the Cordillera; on the contrary, I am inclined to believe that when Lake Titicaca was much higher than at present, the La Paz river broke through the inland range, cutting a gorge about 600 feet in depth, which it has worn slowly down to its present level in the deposits of the basin of clay, shingle, and gravel and large rounded boulders. The amount of detritus or alluvium which the La Paz sends through that gorge in a year is prodigious; it pours it down into the plains of the Beni river. I recollect well one picture—a house on the La Paz river, in a little gorge on the southern flank of the Illimani, and I saw it under most delightful circumstances, embowered in fruit trees, vines, and roses; and looking up the gorge 14,000 feet above the point where I stood, I could see the shimmering, flashing peak of Illimani rising in a sheer slope uninterrupted by a single hill, in all its glory and magnificence, and I remember saying to myself, "The man who scales that pinnacle will be a bold one." I congratulate Sir Martin Conway on having been that man.

The PRESIDENT: We have to thank Sir Martin Conway for many things. I have seldom listened with greater interest to a paper, not only because of the surprising quickness with which Sir Martin Conway in all these travels has taken in the important features of the country, and the character of the physical geography, but also on account of the admirable way in which he has described this magnificent scenery, so that the beautiful slides he has shown us have actually been coloured by his pictorial words. It is a great pleasure to us here to receive such an account of a country which has never before been described to this Society. We had a very interesting paper on Bolivia by Mr. Minchin, now many years ago, but he did not cover this ground. I have listened with great interest to the comments which have been made on the paper by Prof. Bonney and Dr. Woodward, who have shown us the great value of the geological specimens brought home, and to the account given us by the gentleman from Kew of the botanical collection. With regard to the *flora* of the loftier Andean region, I have myself collected tola (*Baccharis Incarum*), which I believe to be a composita, at a height of 17,200 feet in the Andes,

and I would speak in favour of the climate of these great heights as affecting the *flora*—perhaps not such a height as that, but certainly 13,000 feet, where very beautiful trees grow, the scolli (*Bucholleia coriacea*) and the queñua (*Polylepis tomentella*), with a dark leaf light coloured underneath, and a trunk very like that of a yew tree. Large numbers of these trees grow in the cordillera, which I traversed further to the north. All these points are exceedingly interesting, and I am glad to be able to add that the triangulation which has been carried out between the peaks of Sorata and Illimani along the chain will, I believe, be most valuable in the construction of more correct maps of that country. I only hope some day Sir Martin Conway will do the same service on the other or eastern slope. I regret we have not had time to hear from him an equally interesting account of the attempt he made on the magnificent peak of Sarmiento, in the Magellan straits, but I trust, if not at an evening, yet at some afternoon meeting, Sir Martin Conway will give us an account also of that part of his journey.

I am sure you will all join with me in a very hearty vote of thanks to Sir Martin Conway.

ON THE TEMPERATURE OF THE FLOOR OF THE OCEAN, AND OF THE SURFACE WATERS OF THE OCEAN.*

By Sir JOHN MURRAY, K.C.B., F.R.S., etc., of the "Challenger" Expedition.

I. The Bottom Temperature over the Floor of the Ocean.

Our knowledge of the temperature of the floor of the ocean is derived from direct observations in the layers of water immediately above the bottom by means of deep-sea thermometers, from the electric resistance of telegraph cables resting on the bed of the great ocean basins,† and from the temperature of large masses of mud and ooze brought up by the dredge from great depths. All the temperatures recorded up to the present time in the sub-surface waters of the open ocean indicate that at a depth of 100 fathoms all seasonal variation disappears. Beyond that depth there is a constant, or nearly constant, temperature at any one place throughout the year. In some special positions, and under some peculiar conditions, a lateral shifting of large bodies of water takes place on the floor of the ocean at depths greater than 100 fathoms. This phenomenon has been well illustrated by the researches of Prof. Libbey ‡ off the east coast of North America, where the Gulf Stream and Labrador Current run side by side in opposite directions. This lateral shifting cannot, however, be called seasonal, for it appears to be due in most instances to violent storms, or strong off-shore winds, bringing up colder water from considerable depths to supply the place of the surface

* Maps, p. 128. On Map 1 the scale of colouring for the darkest blue should be $-1°{\cdot}11$ C.

† Peake and Murray, *Proc. Roy. Soc., Edin.*, vol. 22, p. 409, 1899, "On the Survey by s.s. *Britannia* of the Cable Route between Bermuda, Turk's Islands, and Jamaica."

‡ W. Libbey, jun., "The Relations of the Gulf Stream and the Labrador Current," Report of the Sixth International Geographical Congress, London, 1895.

drift, so that this colder water covers stretches of the ocean's bed which, under normal conditions, are overlaid by warmer strata of water.

From the point of view of temperature, the whole floor of the ocean may be divided into two regions—

(1) A deep-water region, in which there is a constant, or nearly constant, temperature in the water over the bed of the ocean at all times of the year at any one spot; and

(2) A shallow-water region, in which the sea-bed is subject to periodical variations, or occasional variations, of the temperature through changes in the over-lying water.

The investigations recorded in this paper indicate that the first region occupies over 90 per cent., while the second occupies less than 10 per cent., of the floor of the ocean.

A. *Temperature over the Floor of the Ocean in Depths greater than 100 fathoms (see Map 1).*

In order to study the distribution of temperature in the vast deep-sea region of the ocean, all the known temperatures taken by means of deep-sea thermometers at the bottom of the ocean were, in the first instance, placed on charts, and lines were drawn showing areas where the recorded temperatures were under 30° Fahr., between 30° and 35° Fahr., between 35° and 40° Fahr., and then for every 10°, namely, between 40° and 50° Fahr., between 50° and 60°, and over 60° Fahr. In drawing these lines showing the different bands of temperature over the floor of the ocean, the observations of temperature in the intermediate depths have also been taken into consideration, and especially the lines of equal temperature at different levels, as shown in the maps published by Dr. Buchan in the '*Challenger* Reports.' *

The general results of this investigation are represented on Map 1,† where the blue and red bands of colour illustrate the temperature prevailing on the floor of the ocean in all depths greater than 100 fathoms; the blue shades of colour show temperatures under 40° Fahr. (under 4°·44 C.), and the red shades temperatures above 40° Fahr. (over 4°·44 C.).

This vast deep-sea region, which occupies 93 per cent. of the whole ocean, and 66 per cent. of the whole surface of the planet, is entirely removed from the direct influence of the sun; not only is there a constant temperature at any one spot throughout the year, but the

* See "Report on Oceanic Circulation," Phys. Chem. Chall. Exp., pt. viii., 1895.

† So far as I know, this is the first attempt to represent on a map the temperature over the floor of the whole ocean. Prof. J. Walther ("Ueber die Lebensweise fossiler Meeresthiere," *Zeitschr. d. Deutschen geol. Gesellsch.*, 1897, p. 270) gives a small diagrammatic sketch of the bottom temperature in the Atlantic basin, with a view of pointing out the contrast between bottom and surface temperatures, and a few months ago he urged me to publish a map, such as that now produced.

sun's rays are believed to be nearly all absorbed by passing through the 600 feet of sea-water by which this whole region is overlaid. So far, then, as direct sunlight is concerned, it is a region of darkness. Plant-life appears to be wholly absent from this deep-sea region, and consequently no assimilation of inorganic materials by organisms can there take place. All the animals which flourish in such abundance in the depths of the sea are dependent for their food on organic matter which has been assimilated in the surface and shallower waters of the ocean and on the dry land, where chlorophyll is present. This organic matter subsequently falls to the bottom from the surface waters, or is washed into the deep sea from the surface of the continents and the shallows of the ocean.

The first glance at the accompanying maps shows that the distribution of temperature on the floor of the ocean is fundamentally different from what prevails on the continents and in the surface waters of the ocean, and is governed by quite different laws. At the surface of the earth, both on land and at sea, bands of equal temperature run more or less parallel to the equator, as may be seen on the Maps 2 and 3, showing the minimum and maximum temperature at the surface of the sea. This is true notwithstanding the fact that oceanic currents cause wide deflections, as, for instance, in the case of the Gulf Stream, where the lines trend away to the north-east.

At the bottom of the ocean the lines of equal temperature run, on the whole, north and south, following the general trend of the continents, as may be seen by reference to Map 1. The cold water, which occupies all the greater depths, has been derived from the surface in extra-tropical regions, the greater bulk of this water having received its low temperature in the great Southern Ocean towards the Antarctic. It will be observed that the shades of red, which represent the portions of the ocean's bed covered by the warmer water, form narrow bands along continental shores and around oceanic islands, and are separated from each other by wide stretches of blue shades, which represent the cold water in the greater depths derived from the polar and sub-polar regions.

The darkest shade of blue, indicating a temperature under 30° Fahr. (under −1°·11 C.), is limited to the ice-bound regions of the Arctic and Antarctic oceans, but in the Norwegian sea it extends to the southward of the Färoe islands, where the water in the deeper part of this basin is cut off from general oceanic circulation by the Wyville-Thomson ridge. In this closed area to the north of the Wyville-Thomson ridge and Färoe-Iceland ridge, temperatures as low as 28°·9 Fahr. have been recorded in depths of 2000 fathoms.

The second or intermediate shade of blue, representing a temperature at the bottom between 30° and 35° Fahr., covers nearly the whole of the bottom in the Antarctic and great Southern oceans, and

extends throughout nearly the whole of the Indian ocean. Offshoots extend into the Atlantic and Pacific, and here and there throughout these oceans there are patches of the same colour which indicate connections with the deep waters of the great Southern ocean, or the cold ice-covered seas of the Arctic.*

The palest shade of blue, indicating a temperature between 35° and 40° Fahr., covers nearly the whole of the North Atlantic and a very large part of the Pacific. The average temperature over the floor of the North Atlantic, in depths beyond 2000 fathoms, is about 2° Fahr. above the average temperature at the bottom of the Indian ocean and South Atlantic, while the temperature of the bed of the Pacific is intermediate between these.

Passing now to the red shades in the map, which represent temperatures over 40° Fahr., it will be noticed that these are broadest within the tropics, and gradually thin out and ultimately disappear towards the north and south. The palest shade, representing a temperature between 40° and 50° Fahr., sometimes extends a considerable distance into extra-tropical regions, as, for instance, in the North-East Atlantic, where it run along the coast of Norway. The middle shade of red, indicating a temperature between 50° and 60° Fahr., occupies a narrow strip along the shores of continents and around islands in tropical and sub-tropical regions, and fills the Mediterranean; while the darkest shade, indicating a temperature over 60° Fahr., is represented by a mere line, and is almost wholly limited to the tropics, but fills up the Red sea and covers a portion of the sea-bed in the eastern Mediterranean.

In the Pacific there is, around the islands stretching from New Guinea to the Paumotus, a small strip of the sea-bottom where the temperature touches 70° Fahr. in depths below 100 fathoms, and a like temperature is found in the Red sea and one or two places in the West Indies at depths exceeding 100 fathoms.

With the view of arriving at a more definite notion of the extent of the ocean's floor covered with water at different temperatures, the lines were transferred to equal-surface projection maps, and the areas were measured by means of the planimeter. The results are given in the following tables, where the subdivisions of the ocean adopted in the paper on the "Height of the Land and the Depth of the Sea"† have been followed. From the last table in this Section A, showing the

* As regards the temperature at the bottom of enclosed seas, like the Mediterranean, it would appear that the bottom temperature is determined, to a large extent, by the winter temperature at the surface in the locality; but in the case of some of the partially enclosed seas, as, for instance, the China sea, it is possible that the very low temperature observed at the bottom may be due to the propagation downwards of the temperature acquired by the water at the surface much further northwards, or it may possibly indicate some connection with the open ocean, which will be revealed by future soundings.

† *Scott. Geogr. Mag.*, vol. iv. p. 1, 1888.

general result, it will be seen that of 127,100,000 square miles of the earth's surface covered by the ocean in depths beyond 100 fathoms, 122,700,000 square miles, or 96 per cent., are overlaid by water with a temperature of less than 40° Fahr. (under 4°·44 C.), and that only 4,400,000 square miles, or less than 4 per cent., are covered by water with a temperature above 40° Fahr. (over 4°·44 C.).

NORTH ATLANTIC (including Gulf of Mexico, Caribbean, Mediterranean, Black, North, Baltic, and Norwegian Seas).

	Square miles.
Area over 60° Fahr.	59,000
„ 50°–60° „	720,000
„ 40°–50° „	1,044,000
„ 35°–40° „	13,770,000
„ 30°–35° „	350,000
„ under 30° „	470,000
Total	16,413,000

SOUTH ATLANTIC.

Area over 60° Fahr.	5,000
„ 50°–60° „	50,000
„ 40°–50° „	150,000
„ 35°–40° „	6,400,000
„ under 35° „	3,200,000
Total	9,805,000

ARCTIC OCEAN.

Area 35°–40° Fahr.	1,000,000
„ 30°–35° „	2,585,000
Total	3,585,000

INDIAN OCEAN (including Red Sea).

Area over 60° Fahr.	105,000
„ 50°–60° „	300,000
„ 40°–50° „	540,000
„ 35°–40° „	1,000,000
„ 30°–35° „	14,400,000
Total	16,345,000

NORTH PACIFIC OCEAN (including Bering, Okhotsk, Japan, Yellow, Sulu, China, and Celebes Seas).

Area over 60° Fahr.	66,000
„ 50°–60° „	208,000
„ 40°–50° „	296,000
„ 35°–40° „	23,068,000
„ 30°–35° „	4,735,000
Total	28,373,000

South Pacific Ocean (including Banda, Java, and Arafura Seas).

	Square miles.
Area over 60° Fahr.	35,000
„ 50°–60° „	142,000
„ 40°–50° „	591,000
„ 35°–40° „	19,992,000
„ 30°–35° „	3,100,000
Total	23,860,000

Southern Ocean.

Area 50°–60° Fahr.	11,000
„ 40°–50° „	101,000
„ 35°–40° „	1,660,000
„ 30°–35° „	24,155,000
„ under 30° „	427,000
Total	26,354,000

Antarctic Ocean.

Area 35°–40° Fahr.	3,000
„ 30°–35° „	1,800,000
„ under 30° „	1,500,000
Total	3,303,000

Summary.

Area with bottom temperature over 60° Fahr.	270,000
„ „ „ 50°–60° „	1,501,000
„ „ „ 40°–50° „	2,652,000
„ „ „ 35°–40° „	66,893,000
„ „ „ 30°–35° „	54,325,000
„ „ „ under 30° „	2,397,000
Total	128,038,000

The area of the ocean's floor beyond the 100-fathom line has been estimated, in round numbers, at 127,100,000 square miles; the foregoing figures may be stated as follows, with the corresponding percentages:—

	Square miles.	Percentage.
Area over 60° Fahr. (over 15°·56 C.)	300,000 =	0·24
„ 50°–60° „ (10°·00–15°·56 C.)	1,500,000 =	1·18
„ 40°–50° „ (4°·44–10°·00 C.)	2,600,000 =	2·04
„ 35°–40° „ (1°·67–4°·44 C.)	66,000,000 =	51·93
„ 30°–35° „ (−1°·11–1°·67 C.)	54,300,000 =	42·72
„ under 30° „ (under −1°·11 C.)	2,400,000 =	1·89
Total	127,100,000	100·00

B. *Temperature over the Floor of the Ocean in Depths less than* 100 *Fathoms.*

In order to form some idea of the distribution of temperature over the whole sea-floor, the probable extent of the areas covered by water at different temperatures between the shore and the 100-fathom line

has been estimated. With the aid of Dr. Buchan's maps,* showing the mean annual surface temperature and the temperature at the depth of 100 fathoms, the probable extent of the areas at the temperature-intervals of 10° Fahr. were estimated for small sections along the coast-lines all round the world, and the probable extent of the areas thus obtained were added together to complete each of the larger subdivisions of the ocean. The results obtained are as follows:—

North Atlantic (including Gulf of Mexico, Caribbean, Mediterranean, Black, North Baltic, and Norwegian Seas).

	Square miles.
Area over 80° Fahr.	70,000
„ 70°–80° „	208,000
„ 60°–70° „	709,000
„ 50°–60° „	899,000
„ 40°–50° „	580,000
„ 35°–40° „	222,000
„ 30°–35° „	27,000
„ under 30° „	50,000
Total	2,265,000

South Atlantic.

Area 70°–80° Fahr.	43,000
„ 60°–70° „	203,000
„ 50°–60° „	147,000
„ 40°–50° „	9,000
Total	402,000

Arctic Ocean.

Area 35°–40° Fahr.	30,000
„ 30°–35° „	1,150,000
„ under 30° „	15,000
Total	1,195,000

Indian Ocean (including Red Sea and Persian Gulf).

Area over 80° Fahr.	38,000
„ 70°–80° „	309,000
„ 60°–70° „	404,000
„ 50°–60° „	228,000
Total	979,000

North Pacific (including Bering, Okhotsk, Japan, Yellow, Sulu, China, and Celebes Seas).

Area over 80° Fahr.	93,000
„ 70°–80° „	559,000
„ 60°–70° „	437,000
„ 50°–60° „	208,000
„ 40°–50° „	144,000
„ 35°–40° „	689,000
„ 30°–35° „	158,000
Total	2,288,000

* See Maps 2 and 3 in "*Challenger* Report on Oceanic Circulation" (Phys. Chem. Chall. Exp., pt. viii.), Appendix to Summary of Results, 1895.

SOUTH PACIFIC (including Banda, Java, and Arafura Seas).

	Square miles.
Area over 80° Fahr.	94,000
„ 70°–80° „	549,000
„ 60°–70° „	349,000
„ 50°–60° „	86,000
„ 40°–50° „	8,000
Total	1,086,000

SOUTHERN OCEAN.

Area 50°–60° Fahr.	148,000
„ 40°–50° „	125,000
„ 35°–40° „	123,000
„ 30°–35° „	128,000
„ under 30° „	280,000
Total	804,000

ANTARCTIC OCEAN.

Area under 30° Fahr.	1,100,000

SUMMARY.

Area with bottom temperature over 80° Fahr.	295,000
„ „ „ 70°–80° „	1,668,000
„ „ „ 60°–70° „	2,102,000
„ „ „ 50°–60° „	1,216,000
„ „ „ 40°–50° „	866,000
„ „ „ 35°–40° „	1,064,000
„ „ „ 30°–35° „	1,463,000
„ „ „ under 30° „	1,445,000
Total	10,119,000

The area of the ocean's floor within the 100-fathom line has been estimated in round numbers at 10,100,000 square miles; the foregoing figures may be stated as follows, with the corresponding percentages:—

	Square miles.	Percentage.
Area over 80° Fahr.	290,000 =	2·87
„ 70°–80° „ (over 26°·67 C.)	1,670,000 =	16·54
„ 60°–70° „ (21°·11–26°·67 C.)	2,100,000 =	20·79
„ 50°–60° „ (15°·56–21°·11 C.)	1,210,000 =	11·98
„ 40°–50° „ (10°·00–15°·56 C.)	870,000 =	8·61
„ 35°–40° „ (4°·44–10°·00 C.)	1,060,000 =	10·49
„ 30°–35° „ (−1°·11–4°·44 C.)	1,460,000 =	14·46
„ under 30° „ (under −1°·11 C.)	1,440,000 =	14·26
Total	10,100,000	100·00

It will thus be seen that of the 10,100,000 square miles of the earth's surface covered by the ocean inside the 100-fathom line, 3,960,000 square miles, or 39 per cent., are overlaid by water with a temperature of less than 40° Fahr. (under 4°·44 C.), and that 6,140,000 square miles, or 61 per cent., are covered by water with a temperature above 40° Fahr. (over 4°·44 C.).

C. *Temperature over the Entire Floor of the Ocean.*

If we now combine the figures for the deep-sea region beyond the 100-fathom line with the figures for the shallow-water region within the 100-fathom line, we arrive at the following approximation of the distribution of temperature over the whole sea-floor :—

		Square miles.	Percentage.
Area over 60° Fahr.	(over 15°·56 C.)	4,360,000 =	3·18
„ 50°–60° „	(10°·00–15°·56 C.)	2,710,000 =	1·97
„ 40°–50° „	(4°·44–10°·00 C.)	3,470,000 =	2·53
„ 35°–40° „	(1°·67–4°·44 C.)	67,060,000 =	48·88
„ 30°–35° „	(−1°·11–1°·67 C.)	55,760,000 =	40·64
„ under 30° „	(under −1°·11 C.)	3,840,000 =	2·80
	Total	137,200,000	100·00

It has already been stated that 96 per cent. of the ocean's floor beyond the 100-fathom line is covered by water with a temperature under 40° Fahr., and that 39 per cent. of the ocean's floor within the 100-fathom line is covered by water with a temperature under 40° Fahr. The above figures show that, of the entire sea-floor, 92 per cent. is overlaid by water having a temperature less than 40° Fahr. (under 4°·44 C.), while less than 8 per cent. is overlaid by water having a temperature higher than 40° Fahr. (over 4°·44 C.).

II. The Temperature of the Surface Waters of the Ocean.

So far as we are aware, no previous attempt has been made to prepare maps showing the absolute maximum and minimum temperature of the surface waters over the globe. Many years ago, Prof. Dana, in his 'Manual of Geology,' * published an isocrymal chart based upon the mean temperature of the coldest month of the year, which corresponds somewhat to the minimum map accompanying this paper, but the temperature shown on this map appears always, as might be expected, to be lower than that shown on Prof. Dana's, though comparison is not easy, because Prof. Dana drew his lines at different intervals from those adopted in the present case. The map published in this *Journal* for August last year, illustrating the annual range of temperature in the surface waters of the ocean, was prepared from all the available maximum and minimum temperature observations for the coldest and warmest months of the year in each 2° square over the water-surface of the globe, and we had thus at hand the requisite information for preparing the accompanying maps showing both the minimum and maximum surface temperature of the sea. They are interesting from many points of view, and will doubtless be useful to naturalists.

* Revised edition. Philadelphia : 1865.

A. *Minimum Temperature of the Surface Waters of the Sea* (*see Map* 2).

From the figures supplied to us by the Meteorological Office, the winter minimum (*i.e.* the minimum for February north of the equator, and the minimum for August south of the equator) in each 2° square throughout the great ocean basins was extracted, and the figures thus obtained were compared with observations from every other available source. In this way were laid down on blank maps the lowest recorded readings in every 2° square, and then the lines were drawn at intervals of 10° Fahr., as shown on the map accompanying this paper.

On this map shades of red are used to indicate a temperature exceeding 50° Fahr., and shades of blue to indicate a temperature under 50° Fahr., and it is interesting to observe that the dividing-line representing 50° Fahr. coincides approximately with the 40th parallels of latitude north and south.

The darkest shade of blue, indicating a temperature under 30° Fahr., covers the Arctic and Antarctic regions, lying in the Southern ocean entirely within the latitude of 50° S., and approximating in many places with the latitude of 60° S., while in the North-West Atlantic and North-West Pacific it reaches the latitude of 40° N. The second shade of blue, indicating a temperature of 30° to 40° Fahr., forms a band round the earth in the Southern ocean; in the North Pacific there is an area extending from the Yellow sea to the Alaskan coast and into the Bering sea; in the North Atlantic, a narrow band starts from the east coast of the United States, trending first eastwards and then northwards past the coasts of Iceland, spreading out towards the coasts of Spitsbergen and Norway, and onwards to the coast of Novaya Zemlya. The third shade of blue, indicating a temperature between 40° and 50° Fahr., also forms a band in the Southern ocean, broken only by the extension southwards of the South American continent; a band crosses the North Pacific from the Chinese to the North American coast, narrow in the western portion, but spreading out on approaching the American continent; a similar band crosses the North Atlantic, but its characteristic features are much more strongly pronounced than in the case of the North Pacific, commencing as a very narrow band off the east coast of the United States, and expanding enormously towards the shores of Europe. The palest shade of red, indicating a temperature between 50° and 60° Fahr., forms a band crossing the South Pacific from the west coast of South America, broken for a short distance on the south coast of Australia, thence uninterruptedly crossing the South Indian and South Atlantic oceans to the coast of South America; a band crosses the North Pacific, outside the tropics except for a short distance off the Chinese coast; and a similar band crosses the North Atlantic entirely outside the tropics, and nearly fills up the Mediterranean. The peculiar trend of this area off the west coast of South America, which is still more marked in the next area (60° to 70° Fahr.), is to be accounted for

by off-shore winds and consequent upwelling, as referred to in the paper on "Range of Surface Temperature."*

The second shade of red, indicating a temperature between 60° and 70° Fahr., is found in detached bands crossing the northern and southern parts of the great ocean basins, approximately in the latitudes of the tropics of Cancer and Capricorn respectively, separated by a great circumtropical band of the third shade of red, indicating a temperature between 70° and 80° Fahr. The darkest shade of red, indicating a temperature over 80° Fahr., is found in the equatorial regions of the Pacific and Indian oceans, extending across the East Indian Archipelago from long. 60° E. in the Indian ocean to long. 70° W. in the Pacific; there are also indications that in the Caribbean sea off Yucatan the minimum temperature does not fall below 80° Fahr.

The lines were transferred to equal-surface hemispheres, and the areas marked out were measured with the planimeter, with the following results:—

North Atlantic (including Gulf of Mexico, Caribbean, Mediterranean, Black, North, Baltic, and Norwegian Seas).

	Square miles.
Area over 80° Fahr.	23,000
„ 70°–80° „	6,546,000
„ 60°–70° „	3,775,000
„ 50°–60° „	2,712,000
„ 40°–50° „	2,416,000
„ 30°–40° „	1,329,000
„ under 30° „	1,986,000
Total	18,787,000

South Atlantic.

Area 70°–80° Fahr.	2,981,000
„ 60°–70° „	3,959,000
„ 50°–60° „	2,633,000
„ 40°–50° „	620,000
Total	10,193,000

Arctic Ocean.

Area 30°–40° Fahr.	340,000
„ under 30° „	4,441,000
Total	4,781,000

Indian Ocean (including Red Sea and Persian Gulf).

Area over 80° Fahr.	1,432,000
„ 70°–80° „	8,064,000
„ 60°–70° „	3,691,000
„ 50°–60° „	2,856,000
„ 40°–50° „	1,278,000
Total	17,321,000

* *Geographical Journal*, vol. xii. p. 128, 1898.

NORTH PACIFIC (including Bering, Okhotsk, Japan, Yellow, China, Celebes, and Sulu Seas).

	Square miles.
Area over 80° Fahr.	3,939,000
„ 70°–80° „	13,530,000
„ 60°–70° „	3,949,000
„ 50°–60° „	2,803,000
„ 40°–50° „	1,739,000
„ 30°–40° „	3,983,000
„ under 30° „	816,000
Total	30,759,000

SOUTH PACIFIC (including Banda, Java, and Arafura Seas).

Area over 80° Fahr.	3,163,000
„ 70°–80° „	10,215,000
„ 60°–70° „	6,655,000
„ 50°–60° „	4,685,000
„ 40°–50° „	233,000
Total	24,951,000

SOUTHERN OCEAN.

Area 50°–60° Fahr.	872,000
„ 40°–50° „	8,905,000
„ 30°–40° „	8,247,000
„ under 30° „	8,130,000
Total	26,154,000

ANTARCTIC OCEAN.

Area under 30° Fahr.	4,433,000

SUMMARY.

Area with minimum surface temperature over 80° Fahr.	8,557,000
„ „ „ „ 70°–80° „	41,336,000
„ „ „ „ 60°–70° „	22,029,000
„ „ „ „ 50°–60° „	16,561,000
„ „ „ „ 40°–50° „	15,191,000
„ „ „ „ 30°–40° „	13,899,000
„ „ „ „ under 30° „	19,806,000
Total ...	137,379,000

Or, in round numbers, with percentages—

	Square miles.	Percentage.
Area over 80° Fahr. (over 26°·67 C.)	8,500,000 =	6·20
„ 70°–80° „ (21°·11–26°·67 C.)	41,300,000 =	30·10
„ 60°–70° „ (15°·56–21°·11 C.)	22,000,000 =	16·03
„ 50°–60° „ (10°·00–15°·56 C.)	16,500,000 =	12·03
„ 40°–50° „ (4°·44–10°·00 C.)	15,200,000 =	11·08
„ 30°–40° „ (−1°·11–4°·44 C.)	13,900,000 =	10·13
„ under 30° „ (under −1°·11 C.)	19,800,000 =	14·43
Total	137,200,000	100·00

It appears, from the above figures, that the surface waters of the ocean where the temperature falls below 40° Fahr. (under 4°·44 C.) in the coldest

months of the year, cover an area of about 33,700,000 square miles, or about 25 per cent. of the water-surface of the globe, while the waters having a temperature of over 40° Fahr. (over 4·44° C.) in the coldest months of the year cover an area of about 103,500,000 square miles, or about 75 per cent.

B. *Maximum Temperature of the Surface Waters of the Sea* (*see Map* 3).

For the preparation of the map showing the maximum surface temperature a similar method was adopted; the summer maximum was laid down in each 2° square, and lines were drawn at intervals of 10° Fahr., in a similar manner to that described for the minimum map.

The colours on this map have the same signification as on the minimum map, but since temperatures under 30° Fahr. disappear from the map, only two shades of blue are used, the darker shade indicating a temperature under 40° Fahr., and the paler shade a temperature between 40° and 50° Fahr., both of which are found only far to the north and to the south. The dividing-line between the blue and red colours here approximates in the south with the latitude of about 50° S., and in the North Atlantic and North Pacific with the arctic circle, while, as already stated, in the minimum map this same dividing-line approximates in position with the latitude of about 40° both in the north and south. The striking feature of this maximum map is the great circumtropical belt having a temperature between 80° and 90° Fahr., with here and there—in the Pacific and in the Red sea and Persian gulf—localities where the temperature exceeds 90° Fahr. This belt is broadest towards the western part of each of the great oceans, narrowing towards the eastern boundaries. On the polar sides of this circumtropical belt bands in paler shades of red, indicating successively a temperature between 70° and 80° Fahr., 60° and 70° Fahr., and 50° and 60° Fahr., succeed each other towards the north and south.

On the lines being transferred to equal-surface hemispheres, the areas were measured by the planimeter, with the following results :—

North Atlantic (including Gulf of Mexico, Caribbean, Mediterranean, Black, North, Baltic, and Norwegian Seas).

	Square miles.
Area 80°–90° Fahr.	11,984,000
„ 70°–80° „	2,496,000
„ 60°–70° „	1,637,000
„ 50°–60° „	1,705,000
„ 40°–50° „	737,000
„ 30°–40° „	119,000
Total	18,678,000

South Atlantic.

Area 80°–90° Fahr.	4,570,000
„ 70°–80° „	5,118,000
„ 60°–70° „	505,000
Total	10,193,000

Arctic Ocean.

	Square miles.
Area 40°–50° Fahr.	1,280,000
„ 30°–40° „	3,500,000
Total	4,780,000

Indian Ocean (including Red Sea and Persian Gulf).

Area over 90° Fahr.	393,000
„ 80°–90° „	11,742,000
„ 70°–80° „	4,104,000
„ 60°–70° „	1,084,000
Total	17,323,000

North Pacific (including Bering, Okhotsk, Japan, Yellow, China, Celebes, and Sulu Seas).

Area over 90° Fahr.	54,000
„ 80°–90° „	19,835,000
„ 70°–80° „	5,678,000
„ 60°–70° „	2,702,000
„ 50°–60° „	2,375,000
„ 40°–50° „	39,000
Total	30,683,000

South Pacific (including Banda, Java, and Arafura Seas).

Area over 90° Fahr.	19,000
„ 80°–90° „	16,561,000
„ 70°–80° „	6,775,000
„ 60°–70° „	1,587,000
Total	24,942,000

Southern Ocean.

Area 70°–80° Fahr.	543,000
„ 60°–70° „	4,223,000
„ 50°–60° „	7,248,000
„ 40°–50° „	4,882,000
„ 30°–40° „	9,228,000
Total	26,124,000

Antarctic Ocean.

Area 30°–40° Fahr.	4,433,000

Summary.

Area with maximum surface temperature over 90° Fahr.	466,000
„ „ „ „ 80°–90° „	64,692,000
„ „ „ „ 70°–80° „	24,714,000
„ „ „ „ 60°–70° „	11,738,000
„ „ „ „ 50°–60° „	11,328,000
„ „ „ „ 40°–50° „	6,938,000
„ „ „ „ 30°–40° „	17,280,000
Total	137,156,000

Or, in round numbers, with the corresponding percentages—

		Square miles.	Percentage.
Area over 90° Fahr.	(over 32°·22 C.)	500,000 =	0·36
„ 80°–90° „	(26°·67 to 32°·22 C.)	64,700,000 =	47·16
„ 70°–80° „	(21°·11 „ 26°·67 C.)	24,700,000 =	18·00
„ 60°–70° „	(15°·56 „ 21°·11 C.)	11,700,000 =	8·53
„ 50°–60° „	(10°·00 „ 15°·56 C.)	11,300,000 =	8·24
„ 40°–50° „	(4°·44 „ 10°·00 C.)	7,000,000 =	5·10
„ 30°–40° „	(under 4°·44 C.)	17,300,000 =	12·61
	Total	137,200,000	100·00

The above figures show that the surface waters of the ocean having a maximum temperature under 40° Fahr. (under 4°·44 C.) cover an area of about 17,300,000 square miles, or about 13 per cent. of the water-surface of the globe; while the waters with a maximum temperature over 40° Fahr. (over 4°·44 C.) cover an area of about 119,900,000 square miles, or about 87 per cent.

C. *Mean Temperature of the Surface of the Sea.*

For the sake of comparison the lines on Dr. Buchan's map, showing the mean annual surface temperature of the ocean ('*Challenger* Report on Oceanic Circulation,' Map 2, 1895), were transferred to equal-surface hemispheres, and the areas marked out were measured with the planimeter. This map (which is based on the earlier map published by Lieut. Baillie, revised and brought up to date) was constructed from the mean of all recorded observations in 5° squares, and the lines were drawn through the mean of the positions in each of the squares. On Dr. Buchan's map the line of 30° Fahr. is shown only in the Norwegian sea, and the line of 40° Fahr. is omitted from the North Pacific, but these lines have been filled in approximately from theoretical considerations both in the far north and far south. The results arrived at are as follows:—

North Atlantic (including Gulf of Mexico, Caribbean, Mediterranean, Black, North, Baltic, and Norwegian Seas).

	Square miles.
Area over 80° Fahr.	4,819,000
„ 70°–80° „	5,923,000
„ 60°–70° „	2,868,000
„ 50°–60° „	1,793,000
„ 40°–50° „	1,882,000
„ 30°–40° „	1,229,000
„ under 30° „	194,000
Total	18,708,000

South Atlantic.

Area 70°–80° Fahr.	5,730,000
„ 60°–70° „	3,446,000
„ 50°–60° „	1,007,000
Total	10,183,000

Arctic Ocean.

	Square miles.
Area 30°–40° Fahr.	2,000,000
„ under 30° „	2,781,000
Total	4,781,000

Indian Ocean (including Red Sea and Persian Gulf).

Area over 80° Fahr.	7,969,000
„ 70°–80° „	4,928,000
„ 60°–70° „	3,369,000
„ 50°–60° „	1,046,000
Total	17,312,000

North Pacific (including Bering, Okhotsk, Japan, Yellow, China, Celebes, and Sulu Seas).

Area over 80° Fahr.	9,889,000
„ 70°–80° „	11,213,000
„ 60°–70° „	3,230,000
„ 50°–60° „	2,727,000
„ 40°–50° „	2,808,000
„ 30°–40° „	859,000
Total	30,726,000

South Pacific (including Banda, Java, and Arafura Seas).

Area over 80° Fahr.	7,425,000
„ 70°–80° „	10,452,000
„ 60°–70° „	5,884,000
„ 50°–60° „	1,161,000
Total	24,922,000

Southern Ocean.

Area 50°–60° Fahr.	5,656,000
„ 40°–50° „	10,180,000
„ 30°–40° „	10,337,000
Total	26,173,000

Antarctic Ocean.

Area under 30° Fahr.	4,433,000

Summary.

Area over 80° Fahr.	30,102,000
„ 70°–80° „	38,246,000
„ 60°–70° „	18,797,000
„ 50°–60° „	13,390,000
„ 40°–50° „	14,870,000
„ 30°–40° „	14,425,000
„ under 30° „	7,408,000
Total	137,238,000

Or, in round numbers, with the corresponding percentages—

	Square miles.	Percentage.
Area over 80° Fahr. (over 26°·67 C.)	30,100,000 =	21·94
„ 70°–80° „ (21°·11 to 26°·67 C.)	38,200,000 =	27·84
„ 60°–70° „ (15°·56 „ 21°·11 „)	18,800,000 =	13·70
„ 50°–60° „ (10°·00 „ 15°·56 „)	13,400,000 =	9·77
„ 40°–50° „ (4°·44 „ 10°·00 „)	14,900,000 =	10·86
„ 30°–40° „ (−1°·11 „ 4°·44 „)	14,400,000 =	10·50
„ under 30° „ (under −1°·11 „)	7,400,000 =	5·39
Total	137,200,000	100·00

The above figures show that the surface waters of the ocean having a mean temperature under 40° Fahr. (under 4°·44 C.) covers an area of about 21,800,000 square miles, or about 16 per cent. of the water surface of the globe; while the waters with a mean temperature over 40° Fahr. (over 4°·44 C.) cover an area of about 115,400,000 square miles, or about 84 per cent.

It is very interesting to compare the figures arrived at from the measurement of the areas as laid down on this map of mean annual surface temperature, with the figures obtained by taking a mean of the two numbers representing the measurements of the areas of different bands of temperature as laid down on the maps of minimum and maximum surface temperature, for they should be comparable, though the result of such diverse methods. The figures obtained for each interval of 10° Fahr. by these two methods are shown in the following table:—

	Areas of mean annual surface temperature.	Mean deduced from the minimum and maximum surface temperature.
	Sq. miles.	Sq. miles.
Area over 90° Fahr.	—	200,000
„ 80°–90° „	30,100,000	36,600,000
„ 70°–80° „	38,200,000	33,000,000
„ 60°–70° „	18,800,000	16,900,000
„ 50°–60° „	13,400,000	13,900,000
„ 40°–50° „	14,900,000	11,100,000
„ 30°–40° „	14,400,000	15,600,000
„ under 30° „	7,400,000	9,900,000
Total	137,200,000	137,200,000

General Remarks.

All the figures given in the foregoing pages, as well as an examination of the three maps accompanying this paper, bring out the striking contrast between the temperature conditions on the surface and on the bottom of the ocean. Of the entire sea-floor 92 per cent. is overlaid by water having a temperature under 40° Fahr. (under 4°·44 C.), while of the entire surface of the ocean only about 16 per cent. has a mean temperature under 40° Fahr. (under 4°·44 C.).

From the data available a preliminary attempt was made at a rough

estimation of the proportion of the entire bulk of water in the ocean with a temperature below 40° Fahr.; the result arrived at is that probably more than 80 per cent. of the whole mass of ocean water has a temperature under 40° Fahr., while less than 20 per cent. has a temperature exceeding 40° Fahr.

The maps and tables also suggest some relations of much interest to the biologist and the geologist. Wherever the waters of the ocean have a temperature exceeding 60° Fahr., a more abundant secretion of carbonate of lime by marine organisms takes place than in areas where lower temperatures prevail. The massive coral-reefs are all situated along shores where these high temperatures prevail, and are made up of the shells and skeletons of organisms which, when alive, are attached to or creep over the bottom, and are now called benthonic organisms. The remains of pelagic or planktonic organisms make up an extremely small part of a true coral reef. From the foregoing investigation, it appears that an area of only about 4,000,000 square miles, or 3 per cent. of the floor of the ocean, presents conditions of temperature favourable for the vigorous growth of coral reefs and of those organisms which require a temperature of 60° Fahr. all the year round.

On the other hand, more than half of the surface of the ocean has a temperature which never falls below 60° Fahr. at any time of the year, and in these surface waters of high temperature there is an abundant secretion of carbonate of lime by pelagic molluscs, pelagic foraminifera, coccospheres, and rhabdospheres, and of silica by radiolaria and diatoms. The dead shells and skeletons of these surface or planktonic organisms fall to the bottom of the ocean, and make up the major part of the deep-sea deposits known as pteropod, globigerina, and radiolarian oozes, as well as a very considerable part of the red-clay and blue-mud deposits in deep water. But the temperature at the bottom where these deposits are being laid down is, as we have seen, very low, so that there are mingled in the same marine deposits now forming over a large part of the earth's surface the remains of animals that lived during their whole life in a temperature between 70° and 90° Fahr., and the remains of animals that lived during their whole life at a temperature of 1°, 2°, or 3° Fahr. above the freezing-point of fresh water. The bearing of this on a study of the conditions under which many fossiliferous marine rocks have been laid down is evident.

THE SWEDISH ARCTIC EXPEDITION OF 1898.*

By Prof. A. G. NATHORST.

It is more than forty years ago, viz. in 1858, that the first Swedish expedition, under O. Torell, visited Spitsbergen. To this their first

* Translated by J. T. Bealby, B.A. Map, p. 128.

love the Swedes have stuck with peculiar fidelity, for of some twenty arctic expeditions in all which, during that time, have left the shores of Sweden, no less than thirteen have had for their object the exploration of the islands of Spitsbergen. Through their instrumentality, the western and north-western parts of the archipelago had become tolerably well known, though probably this result would not have been achieved so easily had it not been for the Gulf Stream, which washes the western shores. Indeed, the western coasts are now relatively so easy of access that not only do companies of tourists visit them every summer, but at Advent bay in Ice fjord, on West Spitsbergen, a little hotel has been built for their accommodation.

The eastern shores, on the other hand, are more inaccessible, owing to the packing of the polar ice, carried thither by the cold stream which sweeps down upon them from the east.

Of the various Swedish expeditions which, previous to the year 1898, had sailed for Spitsbergen, only one, namely, that of Baron Nordenskjöld in 1864, entered Storfjord, on the east side of West Spitsbergen, and none had penetrated to the waters east of the whole group. Owing to these circumstances, the obligation to complete the exploration of the archipelago seemed to devolve naturally, and as of peculiar right, upon the Swedes, and we regarded it as especially incumbent upon us to investigate and map King Charles Land. This island, or rather group of islands, was observed in 1864 by Nordenskjöld and Dunér from the summit of White mountain, in Spitsbergen, and accordingly they entered it upon the map which they published in the following year. It is true it had, like so many other islands in those regions, been previously known to the Norwegian whalers and sealers; but Nordenskjöld and Dunér were the first to introduce it to the notice of geographers.

But King Charles Land was not the only island which lay to the east of Spitsbergen, and claimed the attention of Swedish explorers and scientists. There was also the land called White island, which Captain Kjeldsen saw in 1876, and which E. Johannesen re-discovered in 1887. The latter, however, gave it a new name, namely, New Iceland. It is now beyond doubt that this island is identical with the land which was observed as long ago as 1707 by Commander Giles, and called after him Giles (or Gillis) Land.

The exploration of these two insular regions was the chief object of the Swedish expedition of 1898. But as, in all probability, it would not be possible to approach them until the latter part of the summer, it was deemed advisable to devote the earlier weeks of the voyage to the Spitsbergen group, as well as to a stay at Bear (Beeren) island on the way. Our first object, therefore, was to reach the southern part of Spitsbergen in the beginning of June, and make a reconnaissance of the ice. At that early period of the summer the ice would, in all likelihood,

prevent further advance to the eastward. But later on it would no doubt be more accessible, and it would be possible to penetrate as far as King Charles Land and the region to the east of North-East Land, where possibly there exist other islands besides Giles Land forming the link between Spitsbergen and Franz Josef Land.

It may be doubted whether, wealth and population being duly taken into account, there is any country which displays, relatively, as great an amount of private generosity in furthering scientific objects as does Sweden. In the case of our expedition, King Oscar once more set the example; and very soon, through the kindness and liberality of friends of geographical exploration, the necessary means were raised, and the expedition equipped.

In Tönsberg I bought the steam-whaler *Antarctic*, and had her repaired and refitted. She was built at Drammen, in Norway, and, under the name of the *Cap Nor* (*Cape North*), had been employed in the seal fishery off Jan Mayen island. Subsequently she was bought by Svend Foyn, and re-christened the *Antarctic*, and despatched to the Southern seas in quest of whales. The whale-fishing was not a success, although the vessel penetrated to South Victoria Land and the latitude of 74° 10′ S. Nevertheless, the voyage was not fruitless, for on the island of Kerguelen, on the way out, the *Antarctic* made a valuable capture of elephant seals. It may be interesting to mention that one of those who made this voyage was Mr. Borchgrevink, the Norwegian, who is now leading an expedition to the ice of the south pole. Having bought my ship, I had her enrolled on the list of the Royal Swedish Yacht Club, and thus had the proud pleasure of being the first to carry the Society's tridentine flag into those seldom-visited waters of the Far North. The *Antarctic* is a strong and handsome arctic vessel, a little smaller than the famous *Vega*, provided with a double outer planking, and, besides, an "ice-skin" or a third sheathing of greenheart, and with her bow strengthened outside by iron bands. She is very high rigged, sails well, and behaves excellently in a heavy sea.

On her deck I had a deck-house constructed, so as to afford not only a cabin for the captain, but also a laboratory for the scientific staff. The latter was, of course, very small; nevertheless, it proved most useful. In it the doctor's bacteriological apparatus was installed, and there, too, the zoologists and botanists of the expedition carried out their several labours. The official who was charged with the preservation of the vertebrates had a special cabin below deck, and close beside it was a dark room for developing photographic plates, provided with all the necessary chemicals, and so forth.

Mr. Gunnar Larsson, a merchant of Norrköping, made us a present of a cage of carrier pigeons, which we intended to employ in maintaining communication between the vessel and any boat parties that might be sent out. The cage had its place on the roof of the deck-house; and

the birds throve and laid their eggs, and brought off their broods. We had no occasion to make use of them for the conveyance of messages; but the trials we instituted with them answered admirably, for when we took them on shore with us, both at King Charles Land and Spitsbergen, the instant they were released they made direct for the vessel.

In the foremost part of the deck we had, on the port side, a roll of pliable wire rope, the thickness of a man's little finger, some 6600 yards long, a present from the Fagersta factory; and on the starboard side, a thin sounding-line of Italian hemp, 6000 yards long. The wire rope was used for bringing up the zoological trawls and dredges; the hemp rope for soundings and collecting specimens of the sea-water. Moreover, we had a large mechanical sieve, of the pattern used by the Danish Ingolf expedition, for sifting the dredgings we brought up from the bottom of the sea, and separating out the zoological specimens. The Royal Zoological Museum of Stockholm presented us with our trawls and dredges; and for the collection of plankton we had tow-nets of different models.

For commander of the *Antarctic* I had the good fortune to secure Captain Emil Nilsson, of the Swedish Lloyd, a navigator of considerable experience in the arctic seas. He had made numerous voyages to the Yenisei, one of them with *Fraser* in 1878. Then in 1883 he was chosen by Nordenskjöld to command the *Sophia* in the Swedish Greenland expedition of that year.

Including myself, the leader of the expedition, we had nine scientists on board. To Mr. G. Kolthoff (conservator) was deputed the study of the higher animals. I myself took charge of the geology, being assisted, to some extent, by Dr. A. Hamberg (university docent), who also superintended the hydrographical and photogrammetrical labours. Our cartographer was Lieut. O. Kjellström. We four were old comrades, having all taken part in the Greenland expedition of 1883. Dr. A. Ohlin, who superintended the zoological dredgings, had also visited the Greenland seas, partly in the neighbourhood of Jan Mayen, partly in Baffin's bay, when search was made for Björling and Kallstenius. He also took part in the Swedish expedition to Tierra del Fuego. The other four members of the scientific staff were making their maiden voyage in arctic regions. They were Dr. E. Levin (university docent), doctor and bacteriologist; Messrs. Dr. G. Andersson (docent) and H. Hesselman (university graduate), botanists; and Mr. J. G. Andersson, assistant geologist and hydrographer. The crew consisted of eighteen men, so that in all we numbered twenty-eight persons. The second mate and three of the men, old whalers, were Norwegians. The first-mentioned had made twenty-three voyages to Jan Mayen; this was, therefore, his twenty-fourth visit to the arctic waters.

Bear Island.

We set sail from Gothenburg on May 25, and reached Tromsö on June 4. On the way up, I stayed a day at Andö island, one of the Lofoten group, for the purpose of studying the Jurassic coal-formations of Andesnes. Leaving Tromsö again on the afternoon of June 8, we

FIG. 1.—BEAR ISLAND.
(Reduced from the original map.)

directed our course for Bear (Beeren) island, taking hydrographical and zoological soundings on the way. Early on the 13th we made Bear island (Fig. 1), and anchored in Sydhamnen (Southern harbour).

Although Bear island lies relatively near to Norway, comparatively very little was hitherto known about it; for one thing, it had never

been properly mapped. This must, no doubt, be attributed to the absence of good harbours, as also to the prevalence of dense mists and the masses of drift-ice which are wont to beset the island, even to a late period of the summer. In 1882, when in about the same month I endeavoured to make the island, I was not able to get within sight of it, so broad were the fields of pack-ice which surrounded it. But in June, 1898, the island was absolutely free from ice; there was not a glimpse to be seen even from the summit of its highest elevation.

The coasts of Bear island exhibit all round striking evidence of the destructive power of the sea, and consequently present very fantastic outlines. On the south, where they rise to an altitude of 1300 feet,

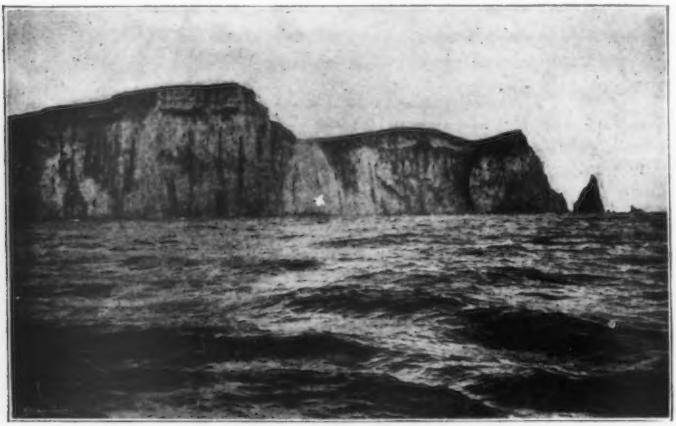


FIG. 2.—BEAR ISLAND, SOUTHERN EXTREMITY WITH THE STAPPEN, SEEN FROM THE WEST.
(*From a photograph by A. Hamberg.*)

they plunge precipitously into the ocean, and are fenced about by sharp-pointed, isolated sea-cliffs, like, *e.g.*, the Stappen (Fig. 2), at the end of the southern promontory, which is pierced near the sea-level so that you can see right through it. On the west side there is a narrow pillar or column called the Needle or Awl (Syl), the appearance of which abundantly justifies its name. Of the remaining sea-cliffs scattered round about this island, I will only mention one more, the Burgomaster Gate (Fig. 3), so called from the enormous quantities of burgomaster gulls which breed upon it. This rock too is pierced, so that it is possible to row through the opening in a boat.

The eastern side of Bear island is dominated by Mount Misery, a table-mountain with three pyramidal peaks on the plateau, the Three Crowns, the highest of which attains an altitude of 1760 feet. On the north and north-west the island is low, not more than 120 to 160 feet

above sea-level; but even there the coasts are, for the most part, steep and only at few places accessible. All this northern portion of the island is the most desolate region it is possible to conceive—nothing but a wilderness of barren stones, almost extremely unrelieved by vegetation. As a matter of fact, vegetation is entirely scanty all over the island; what there is is confined to a few solitary oases of yellow *Ranunculaceæ*, red and white saxifrages, white mouse-eared chickweed (*Cerastia*), species of yellow and white *Drabæ*, some grasses, and a few other species. The Norwegian geologist Keilhau describes the island as "a skeleton of the Earth stripped absolutely naked," and it is a very true and accurate description.

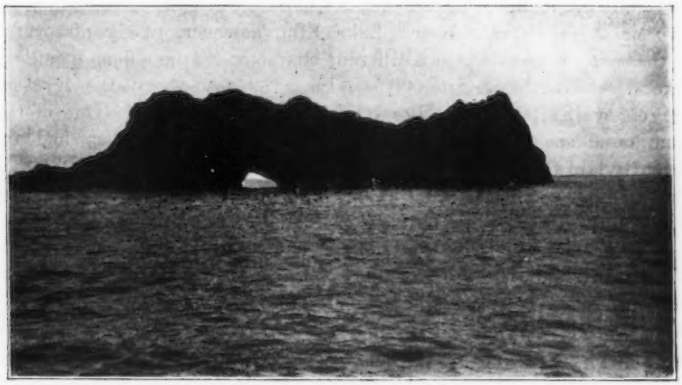


FIG. 3.—THE BURGOMASTER GATE, BEAR ISLAND.
(*From a photograph by A. Hamberg.*)

But though the vegetation is scanty and the interior a barren stony waste, the coasts make ample amends; they teem with bird-life. To the south of the little bay in which we cast anchor there is a cliff, the Bird Mount (Fågelfjell), which rises perpendicularly from the sea. This literally swarmed with auks, kittiwakes, and fulmars; there were hundreds of thousands, nay, millions of them. Every ledge, every projection of the upper coast-cliffs was thick with birds, engaged in the important duties of incubation. Upon firing a shot, they rose into the air and hovered about the cliffs like a dense shower of snow; and yet there seemed to be quite as many left behind on the rocks.

Mr. Kolthoff's sharp eyes distinguished amongst them the razor-bill (*Alca torda*), a species which was not hitherto known to frequent the island. That tyrant of the northern sea-birds, the burgomaster gull, had also its regular nesting-places there, favouring especially the small sea-cliffs and "stacks" scattered around the coasts.

We spent a week at Bear island, a week of strenuous toil, for it was uncertain how soon the wind might change and render our anchorage unsafe. Lieut. Kjellström and his men walked all round the northern part of the island, and surveyed it for the purposes of a map. On his return he completed the survey of the southern half, which had in the mean time been partly mapped by Hamberg. The map (of which Fig. 1 is a reduced copy) which was drawn out on the basis of these observations, on the scale of 1 : 50,000, proved that the island is appreciably smaller than represented on most previous maps, as also that its form is different. In the northern part of the island there were a countless number of small lakes; but as in all probability these mostly dry up later on in the summer, they were not entered on our map, especially as to have entered them accurately would have demanded two or three weeks' labour. Lake Ella, however, newly discovered in the south-west, possesses a different character. It is a deep mountain lake with clear water, its surface lying 69 feet above the level of the sea, whilst its bottom lies 30 feet below that level. One of the men found some old pieces of oars beside the lake. They had apparently lain there a very long time, and would seem to indicate that some of the Norwegian or Russian seal-hunters, who have spent the winter on the island, had boats on the lake.

The geological results were not less important than the geographical. We already know that there were fossiliferous strata of the Permo-Carboniferous Age on Mount Misery, as also that in a few other places there was a species of coal-bearing sandstone with plant remains, this rock belonging to the transitional period between the Devonian and the Carboniferous systems. Besides these, certain Primary deposits were known to occur in the southern part of the island. The precise age of these last had not, however, been ascertained; but we discovered in them Orthoceratites and other fossils, on the strength of which Prof. G. Lindström assigns them to the Lower Silurian. We also discovered an extensive series of marine rocks, these too fossiliferous, and belonging to the Lower Carboniferous. Moreover, we ascertained that the three pyramidal summits of Mount Misery, the Three Crowns, belong to the Triassic formation. Thus we were able to establish the occurrence on Bear island of three geological systems which were not previously known to exist there.

Geologically, the history of the little island is thus very interesting. At the present time there are no glaciers to be found on it, and we did not know with certainty what its history had been during the Great Ice Age. When in 1870 I made my first voyage to the arctic regions, I spent a few hours on this island, and thought I was able to detect the presence of glacial striæ on the east coast, north of Mount Misery. But as at that time I was under twenty years of age, and had not had much geological experience, I often wondered since if my observation

had been correct. On the present occasion I not only had the good fortune to find the place again, and satisfy myself that my observation had been perfectly correct, but I also discovered glacial striæ in various other localities, and thus was able to satisfy myself that during the Glacial epoch Bear island was completely covered with "inland" ice. Yet, strange to say, the glacial centre was not on the higher parts of the island, but on the lower level west of Mount Misery. This, however, presupposes an almost incredible precipitation of snow on that portion of the island.

Bear island is tolerably rich in varieties of mineral; it was even alleged that traces of silver had been found. The most valuable mineral, however, is, or rather will be, the coal-seams in the northern part of the island. If these deposits are to be exploited—and that is merely a question of time—it will, I have little doubt, be found expedient to sink a shaft on the low northern part of the island, and connect the mine with the coast by means of a tramway. The execution of this plan will depend principally upon whether it is possible, by building a breakwater across the northern harbour (Nordhamnen), to make it sufficiently safe for vessels to load there. One difficulty would, at any rate, have to be reckoned with: in some years access to the island would be entirely prevented for several weeks in the early part of the summer by the drift-ice.

Round about Spitsbergen.

On June 20 we steamed away from Bear island, all the members of the scientific staff being hard at work recording the results of their respective labours. We had made good botanical and zoological acquisitions, and during the whole time of our stay the doctor's bacteriological apparatus was never idle. We had not got far from the island before it was withdrawn from our gaze by the dense mist in which it is almost constantly enveloped.

We next directed our course towards Hope island, of which we obtained our first glimpse on June 22. It had been my intention to examine and map this island, but my purpose was frustrated by the extraordinarily heavy swell. Besides that, landing is at all times difficult by reason of the steep shores and the shallow water which washes them. This island (see Fig. 4) is a very narrow ridge running north and south, built up of horizontal strata, which belong, probably, to the Jurassic system. It was destitute of the slightest pretence of a harbour.

Hope island was equally as free from ice as Bear island; but the outlook man in the "crow-nest" reported the appearance of ice to the north-east. Accordingly we steamed in that direction, that we might ascertain its character. At 4 o'clock on the morning of June 23 I was awakened by a sharp bumping, which shook the vessel from stem to

stern, followed by a scraping sound, and this was repeated several times. I knew perfectly well what these sounds meant—we were in the pack-ice; and I hurried up on deck. It was a splendid morning, the sky flooded with bright sunshine, and the ship surrounded on all sides by sheets of ice of all sizes, glittering white on the upper surface, but blue or greenish on the edges—a beautiful sight—we were just breaking through the thicker ice (77° 25′ N. lat., 27° 30′ E. long.); beyond it the pack was somewhat thinner. We continued to plough our way onwards for a while; but soon the ice began to get thicker and thicker, and shortly afterwards we came to the edge of the solid pack-ice, the "firm ice" as the whalers and sealers call it, which successfully defied all our efforts to force a passage through it. By this time we had

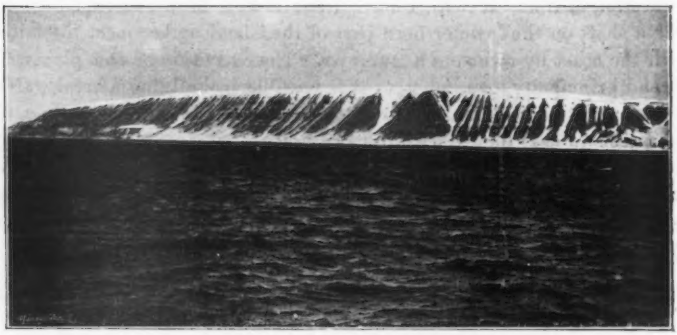


FIG. 4.—EAST SIDE OF HOPE ISLAND.
(From a photograph by A. Hamberg.)

reached 77° 30′ N. lat., 28° E. long. The lookout man was unable to perceive any opening towards either the north, the north-east, or the east, and the vivid ice-blink—the bright reflection of the sky immediately over solid ice—told plainly that it would be impossible to penetrate further in that direction. This was, indeed, precisely what I had anticipated. At all events, I was satisfied with what I saw. The ice was not thick, and in the course of a few weeks we should, no doubt, be able to force our way through it without much difficulty. And my regret at having to turn back was the less that at this season King Charles Land was certain to be deeply sheeted with snow, so that our botanical as well as geological labours would have yielded far fewer results than they did when we returned later on in the summer.

This was on the day before midsummer, a day which fully justified its name, for the thermometer registered 46°·6 Fahr. (7° C.) in the shade, and 69°·8 Fahr. (21° C.) in the sun. We accordingly turned back, and, doubling the southern end of Edge Land, made for the west side of

Storfjord. There we landed (Fig. 6) on June 25, and reaped a good geological harvest, notwithstanding that the ice and snow hampered us considerably; and, indeed, rendered it inexpedient to continue the work. We therefore steamed round South cape, and steered northwards towards Bell sound. On the 27th we cast anchor in Recherche bay, and there we stayed close upon three weeks.

As, according to the plan of our expedition, we had some time to spend in West Spitsbergen, it seemed to me that we could not employ

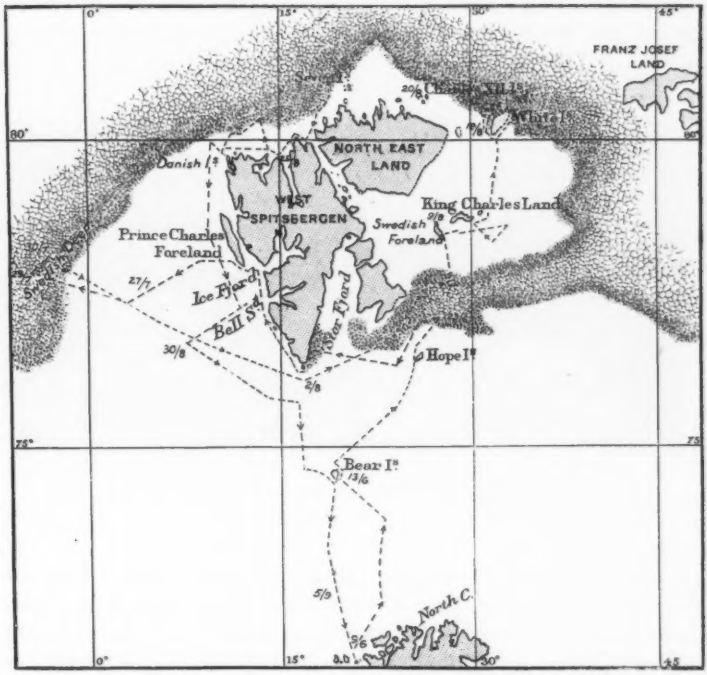


FIG. 5.—SKETCH OF THE COURSE OF THE *ANTARCTIC* IN 1898.

it to better advantage than in mapping that fjord—the largest but one on the west side of Spitsbergen—as well as by making a thorough examination of it, geologically, botanically, and in other ways. And there was also another advantage gained. The anchorage in Recherche bay is so good, that we were able to put out our furnaces, and so save three weeks' coal—a circumstance we were thankful for later on in the summer when we went east again.

Lieut. Kjellström laid down, by the usual cartographical method,

on the scale of 1 : 100,000, the northern arm of the fjord, Van Mijen bay, which proved to be nearly twice as long as shown on previous maps. At the same time, Hamberg, using the photogrammetric camera, charted the other arm, Van Keulen bay. Simultaneously with this, the geologists, zoologists, and botanists thoroughly explored the same two fjords; and during the whole of our stay, the doctor's bacteriological apparatus was incessantly at work. This is not the place to dwell upon the interesting geological results obtained. I must confine myself to stating that we discovered the presence of the same fossil Rhætian flora, which exists in Scoresby fjord on the east coast of Greenland; and proved that the Tertiary strata so rich in leaf-impressions, which I discovered in Ice fjord in 1882, were also extensively represented in the

FIG. 6.—PART OF THE WESTERN SHORE OF THE STORFJORD.
(*From a photograph by O. Kjellström.*)

branches of Bell sound. In the places where these strata occur, you literally walk in fossils up to the knees, amongst them being magnificent specimens of leaf-impressions of marsh cypresses, alders, limes, magnolias, and other trees. A very noticeable feature about these leaf-impressions is that they are of an extraordinarily large size. It was a veritable El Dorado for the geologist; and yet it vexed us with the tortures of Tantalus, seeing that we had to leave behind us so much that we desired to take away.

Whilst staying in Recherche bay we had opportunities for hunting reindeer. On previous occasions when I had hunted reindeer in these high arctic regions, I had invariably found the animals exceedingly shy, from having been hunted before. But on this occasion we reached the interior of Van Mijen bay so soon after the departure of the ice, that the reindeer had not that season been disturbed by hunters. Thinking that the animals were as shy as usual, we approached them with the

utmost degree of caution, crawling upon our hands and knees, dragging ourselves forward on our stomachs, and keeping carefully out of the wind. But in the course of a few days we learned that we had only to show ourselves openly, and the natural curiosity of the animals would bring them within range of their own accord. After that we lost all pleasure in hunting them. On one occasion three reindeer approached within ten paces of the spot where I stood, whilst two big bucks with antlers remained gazing only a little further off. Although I had my rifle on my shoulder, I, of course, refrained from shooting. And I am pleased to be able to add that the other sportsmen of the expedition were of the same opinion as myself. We only shot, therefore, just as many as we wanted, although it would have been easy to have multiplied our game-lists. The poor creatures suffered enough as it was; for I afterwards heard most disgraceful stories of the barbarous way in which tourists shot every reindeer they could get within range of, and left the bodies to lie and rot where they fell.

On July 16 we left Bel sound and put in at Ice fjord, and on the following day cast anchor in Advent bay. At the post-office in the tourist hotel we received our first batch of letters since leaving Tromsö, and on the following mail-day, the 22nd, our last letters during the voyage. We stayed some days in Ice fjord, and, visiting various points in the locality, made more than one discovery of importance. Of these, however, I will only mention that we found the first Coleoptera yet noticed in Spitsbergen. These creatures had been diligently sought for by scientists, but none had hitherto been discovered, although whilst working in Klaas Billen bay in 1882, I fancied I observed a little staphylinid underneath a stone. But the creature escaped me, and in spite of diligent searching, I failed to find any more. In Coles bay we now discovered not only the same species as I thought I had observed before, but also a curculionid, living under the dwarf birchs, so that Spitsbergen really possesses at least two species of Coleoptera.* The presence of the curculionid is a fact of considerable importance in the history of zoological distribution. Although the same species occurs in Lapland and the western portion of Finmark, it is not found in eastern Finmark, nor yet in Iceland or Greenland, whilst the staphylinid does occur in each of these last.

From Coles bay we went to Safe haven (Fig. 7), and thence further to the west.

It had been part of my original plan to map the Storfjord. But after the Swedish Government resolved to send out an expedition for the purpose of measuring an arc of meridian at Spitsbergen, I decided

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* According to Prof. Aurivillius, the staphylinid belongs to the genus *Homalota*, and is very probably *H. islandica* (Kraatz), whilst the curculionid is *Orchestes saliceti* (Fabr.).

to abandon that portion of my scheme. The Russian and Swedish scientists who will be sent to carry out this object will no doubt have ample opportunity to map the Storfjord. In place of that, I resolved to turn my attention to the Swedish deep, on the edge of the Greenland ice, and there make fresh soundings — an object which Prof. Pettersson had so much at heart in the interests of the hydrography of the Arctic ocean. The Swedish Arctic expedition of the *Sophia* in 1868 believed they had reached a depth of 2650 fathoms, and it was for the special purpose of testing this measurement that we carried with us such a long sounding-line and wire rope.

In consequence of this, on July 24 we left Ice fjord for the west, but before getting clear of the fjord we discovered that at its entrance the warm water of the Gulf Stream predominated to the bottom at a depth

FIG. 7.—AUK HORN IN SAFE HAVEN.
(*From a photograph by O. Kjellström.*)

of 220 fathoms. In 1890, when Gustaf Nordenskjöld sounded in the same place, he found that the Gulf Stream was simply a superficial current, flowing over a vaster volume of colder water. Consequently, the relations had materially altered in the interval. At the present time the Gulf Stream seems to flow in an exceptionally wide and deep current, and this sufficiently explains the unusual favourable conditions of the ice during recent years. After a short visit to the west shore of Prince Charles foreland, we steered for the west, and very soon reached a depth of 1475 fathoms. This figure remained pretty constant in subsequent soundings, for the greatest depth we recorded was only 1720 fathoms. In the Swedish deep the sounding-line touched the bottom at 1475 fathoms, or over 1000 fathoms less than had been previously supposed. There can be little doubt that this discrepancy is to be explained as due to the imperfect methods of sounding employed thirty years ago. As a matter

of fact, it is more difficult than would be believed to know with certainty when you do touch the bottom at such great depths. The lead we employed weighed 77 lbs. avoir., and when it was sent to the bottom its weight was further augmented by two sinkers, each weighing 110 lbs. avoir. But notwithstanding this, it was by no means easy to tell when it touched the bottom, for the line still continued to run out in consequence of its own intrinsic weight. As a check upon it, we had recourse to the watch. Every 100-metre length was marked with a piece of cloth. We timed by the watch the time it took for each successive length to cross the gunwale. As soon as the lead really rested on the bottom, the rope paid out more slowly, though without the watch to check it, it was impossible to tell this. The soundings were all taken by Mr. Hamberg, and he was never once mistaken as to when the lead really reached its goal. With each sounding we also brought up specimens of the sea-water, both from the bottom and from higher levels; thus our soundings took a good deal of time. An even greater amount of time was consumed by the trawl, which was let down on the other side of the vessel as soon as the soundings were completed, for in this case we were obliged to let out 5250 yards, or nearly 3 miles, of wire rope. And great was the expectation when the trawl came to the surface with its varied assortment of denizens of the great deep.

Our last soundings were taken at the edge of the Greenland ice, which, as in 1868, formed a gulf running westwards. As this ice, which drifts southwards along the east side of Greenland, is the same ice which carried Nansen's *Fram* across the polar ocean, I had specimens of the diatoms gathered which were found in the pools on its surface, as well as of the clayey mud which stuck to some of its ice-cakes. It is interesting to state that, according to the examination made by Prof. Cleve, the diatoms completely agree with the species which led Nansen to infer that the original starting-point of this drift-ice is to be found off the north of Siberia.

We left the Greenland ice on July 30, a beautiful sunny day, as fine as June 23 had been. We should have liked to stay there longer, but it was full time we were making a move for King Charles Land.

The journey back round the southern end of Spitsbergen presented no difficulties for so stout a polar voyager as the *Antarctic*. We passed South cape on August 2. During the following night, whilst crossing the entrance of the Storfjord, we encountered some ice, and again on the morning of the 3rd, off the south-east of Edge Land. On the afternoon of the same day we drove into the ice in earnest. Fortunately it was, on the whole, pretty evenly distributed, and presented no real difficulty to the *Antarctic*, though to a vessel less strongly constructed it would probably have proved an insuperable obstacle. All the rest of that day, and right on until one o'clock on the morning of August 4, we ploughed our way through the ice, and finally emerged into open

water. We now began to keep an eager look-out for King Charles Land. The first land we got sight of was King Charles island, which lies to the east; then about an hour later we perceived Swedish foreland, and finally, far away to the east, Mount Johnsen. But we were still a long way off, and it was two o'clock in the afternoon when we cast anchor on the south side of Swedish foreland. It was with a strange interest that I gazed upon this portion of mother Earth, which for a period of no less than twenty-eight years had hovered before my imagination, and which I had worked so hard to reach. I had thought—nay, to speak frankly, I had hoped—we should have a hard struggle to get through the ice, and was a little disappointed that our experience was limited to the slight skirmish we had. But, at any rate, here we were at the long-wished-for goal.

The following days were days of strenuous toil, like the period of our stay on Bear island; for here too our anchorage was insecure, and it was very uncertain how long we should be permitted to remain. Consequently we were obliged to make the best use of our time, and for three days we worked very hard. On the morning of the fourth day there was such a heavy swell, that communication between ship and shore was entirely suspended. In the afternoon, however, the swell abated a little, so that Lieut. Kjellström, who had returned from his surveying trip round the island, was fortunately able to come on board. On the following day we moved to the south-west extremity of the island, where we had some work to finish, and in the afternoon turned eastwards towards King Charles island, and anchored on the east side of a basalt promontory, Cape Altmann.

King Charles Land.

As already said, King Charles Land was first made known to geographers by Nordenskjöld and Dunér, who first saw it from the summit of White mount on Spitsbergen on August 22, 1864. "The view we obtained," they write, "was the most impressive to be found in Spitsbergen. At the distance of some 80 nautical miles to the east we saw a high land crowned by two rounded summits, which towered up conspicuously above the neighbouring peaks. It was the western projection of a vast arctic continent, as yet almost unknown; a land which, although discovered by Commander Giles as long ago as 1707, had in the interval been entirely forgotten, so that there was no trace of it to be seen on any of the existing maps. All the space between that continent and Spitsbergen was covered with one vast unbroken sea of ice, through which no vessel could possibly force a passage. For this reason we were reluctantly compelled to abandon our desire to visit that unknown land." *

* 'Svenska Expeditionen till Spetsbergen år 1864,' p. 130. Stockholm. 1867.

The accompanying illustration (Fig. 8) is a facsimile of a sketch reproduced on p. 152 of the same work.

On the map which followed an essay on the geography of Spitsbergen, by the same two explorers, in the *Transactions* of the Royal Swedish Academy of Sciences,* this "rediscovered continent" is named Giles land. We know now, however, that the real Giles Land lies further to the north; consequently Nordenskjöld and Dunér's identification is inaccurate. And, as a further consequence, these two explorers may legitimately claim to have been the first to direct the attention of geographers to the archipelago in question, for an archipelago it is, not a continent.

FIG. 8.—KING CHARLES LAND, FROM THE SUMMIT OF THE WHITE MOUNTAIN.
(*From a sketch by N. Dunér*, 1864.)

According to a communication made through *Petermanns Mitteilungen* by Prof. A. Newton, the land which the two Swedish explorers thus discovered was likewise seen in the same year and the same month by the Englishman Birkbeck. We read, "In August, 1864, Birkbeck, sailing further to the east, came in sight of Gillis (Giles) Land, which was seen by the Swedish expedition from the summit of White mount (3000 feet) in East Spitsbergen, and which they placed in 79° N. lat. and 28° 30′ E. long. But according to Newton's information, the land in question extends 100 nautical miles to the south, *i.e.* as far as 77° 20′

* Compare N. Dunér and A. E. Nordenskjöld, "Anteckninger till Spetsbergens Geografi," in *Kon. Svenska Vetens.-Akad. Handlingar*, vol. vi. No. 5. Stockholm. 1865.

N. lat., and in front of it lies an island 40 miles long, which he calls Helina island." *

This account agrees so ill with the real position and extent of King Charles Land, that it is difficult to avoid the conclusion that Birkbeck, like Von Heuglin and Von Zeil a few years later, was the victim of an optical illusion.

The two German explorers whom I have just named, describing what they saw in 1870 from Mount Middendorff, on the south side of Walter Thymen sound, say, "On the distant horizon, in N. 66¼° E. (magnetic meridian), we beheld a lofty flat-topped mountain, apparently entirely free from snow, with very steep sides, sloping evenly and regularly downwards—an island or foreland belonging to 'the mythical land in the east.' This mountain was probably not less than 60 nautical miles from the spot whereon we stood. And although the horizon in that direction was very hazy, nevertheless, beyond the flat-topped mountain already spoken of, we were able to make out, even with the naked eye, a long row of sharp-pointed summits, in part covered with snow, which stretched from N. 76¼° to 80° E. (*i.e.* from our standpoint), and then disappeared in the mist. Likewise to the north-east of the flat-topped mountain mass we thought we could discern another group of sharp-pointed mountain-peaks peering out of the haze. All these belong to a large continent, to which we have given the name of King Charles Land." † To those who have seen King Charles Land, it is plain that the sharp-pointed mountain-peaks which the German explorers were under the impression they saw in the extreme distance were merely clouds, or were due to the effects of mirage reflected from a broken sea of drift-ice; as, indeed, Kükenthal has already suggested (see below). There are no sharp-pointed mountains anywhere on King Charles Land. The flat-topped mountain mass which Von Heuglin and his companion saw was without doubt the very same that Nordenskjöld and Dunér sighted. But the vast continent of King Charles Land, which was trumpeted abroad as such a great discovery and set out on a number of maps, has no real existence.

To the high tableland on the west, which Von Heuglin identified with the flat-topped mountain-land seen by Nordenskjöld and Dunér, he gave the name of Swedish foreland, whilst the other illusory land was christened King Charles Land, after the reigning king of Würtemberg. The same name was also given to the real King Charles Land by Prof. Mohn,‡

* *Petermanns Geog. Mitteil.*, Ergänzungsband iv. part 16, p. 13. 1865.

† Th. von Heuglin, 'Reisen nach dem Nordpolarmeer in den Jahren 1870 und 1871,' i. p. 179. Braunschweig. 1872. See also Th. von Heuglin, "Aufnahmen in Ost-Spitzbergen im Sommer 1870," in *Petermanns Mitteil.*, 1871, p. 176.

‡ H. Mohn, "Norske Fangst-Skipperes Opdagelse af Kong Karl-Land," in *Videnskabs-Selskabets i Kristiania Forhandlinger* for 1872; and "König Karl-land im Osten von Spitzbergen und seine Erreichung und Aufnahme durch norwegische Schiffer im Sommer 1872," in *Petermanns Mitteilungen*, 1873, p. 121, plate vii.

in his first attempt to lay down a map of that region on the basis of information supplied by Norwegian sealing captains; but in so doing he desired to commemorate, not the King of Würtemberg, but Charles XV., King of Sweden and Norway, for it was in the last year of this king's reign that the first landing was made on the islands in question. One of Mohn's captains, Nils Johnsen, had landed on the east side of the archipelago, whilst two others, Captains J. Altmann and Johan Nilsen, sailed more or less close to its shores. The accompanying sketch-map * (Fig. 9), which Prof. Mohn put forward as being distinctly nothing more than a first rough attempt, embodies the information he collected from these sources. From Mohn's paper, it appears that the

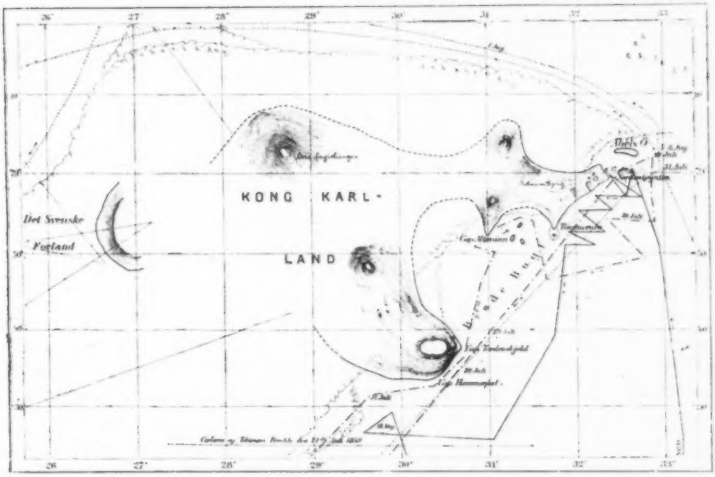

FIG. 9.—KING CHARLES LAND. REDUCED FACSIMILE OF MOHN'S MAP OF 1872.

islands were also seen from a greater or shorter distance by Captain Elling Carlsen in 1859 and 1863, by Captain S. Tobiesen in 1864, and by Captain Ulve in 1871 (from Thumb point).

Altmann and Johnsen placed at Mohn's disposal, not only their observations, but also two sketches of so much of the islands as they respectively saw, and these sketches form the foundation of his map. Altmann's map, notwithstanding its obvious shortcomings, affords the better general view of the archipelago as a whole, whilst Johnsen's gives the best outline of the eastern part of King Charles island. In order to satisfy myself as to the correctness of the identifications

* For the sake of easier comparison all the accompanying facsimile sketch-maps are reproduced on the same scale; to this end it has been necessary to reduce most of them.

in Mohn's map, I begged him to favour me with a sight of Altmann's and Johnsen's originals. He very generously complied with my desire, for which I herewith publicly tender him my thanks. In considering the facsimile of Altmann's map (Fig. 10), which was plotted by (naval) Lieut. Mathiesen, it is important to remember that Altmann's data rest entirely upon compass-bearings and approximate calculations, so that the errors in his map are not to be wondered at. The small island lying to the east is the same as that which Johnsen calls Abel island; Altmann's Bear island is the land round Mount Johnsen, and Giles island is the western part of King Charles island, together with the two islands which lie off Cape Altmann—this higher western part being connected with the higher country round about

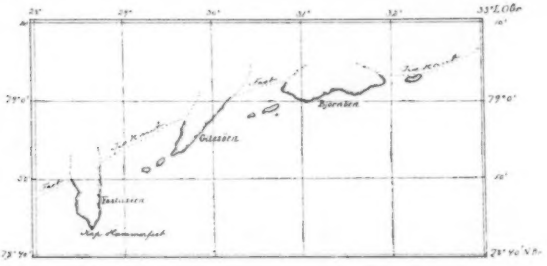

FIG. 10.—KING CHARLES LAND, ACCORDING TO ALTMANN.

Mount Johnsen by a belt of low ground. Firm Ice island (Fastisö) is Swedish foreland, which Altmann quite correctly represents as being separated from Giles island by a broad sound.

It is, however, an error on Altmann's part to have regarded Giles island and Bear island as separate; still the error is excusable, for the low tract which connects them is so low that in misty weather or from any great distance it is completely invisible. This error was, however, corrected by Captain J. Nilsen, who, in the *Freia*, sailed along the north side of the island (King Charles) in the same year.

Turning now to the sketch-map of Captain N. Johnsen (Fig. 11), which was plotted by J. C. Hansen, an instructor in navigation, the first thing that strikes the attention is the correctness with which the contours around Mount Johnsen and Timmerness are delineated, as also the situation of Hårfagrehaugen. But the same cannot be said of the south coast, for all that portion of it which lies west of Timmerness is carried very much too far to the south. If, however, we turn the map so that the coast between the ness just named and Cape Tordenskjold falls into a due east-west direction, the map will then give us not at all a bad representation of Broad bay. In that case Cape Tordenskjold answers to the high plateau of (Altmann's) Giles island; whilst

Johnsen does not appear to have observed the low promontory (Cape Altmann) which projects from the southern side of the island.

Johnsen's statement, that the three principal outstanding points of King Charles island—Cape Tordenskjold, Harfagrehangen, and Mount

FIG. 11.—KING CHARLES LAND, ACCORDING TO N. JOHNSEN.

Johnsen—when seen from a little distance away, look like three separate islands, agrees fully with the contour sketch which I made of King Charles island from south-east on August 16 (Fig. 12). Indeed, seen from a still greater distance, the western portion again seems to be

FIG. 12.—KING CHARLES ISLAND, FROM THE SOUTH-EAST.

divided into two, so that in all there appear to be four separate islands (Fig. 13). From all this I am not disposed to accept the identification of Cape Tordenskjold with the southern extremity of Swedish foreland;

FIG. 13.—KING CHARLES ISLAND, FROM THE SOUTH-EAST, DISTANT VIEW.

I think, rather, there cannot exist the smallest doubt that Johnsen saw nothing more than King Charles island, and did not see Swedish foreland at all.

In 1884 the two sealing captains, H. C. Johannesen and Hemming

Andreasen, reported the discovery of two new islands lying to the east of King Charles Land. But I do not propose to dwell upon their observations (printed by Karl Pettersen in *Ymer*, p. 223, for the same year), seeing that they are admittedly erroneous. King Charles island was seen at such a great distance as to present the appearance of distinct islands, as K. Pettersen, Kükenthal, and Pike have each pointed out.

Altmann's statement, that there existed a sound between Swedish foreland (Firm Ice island) and King Charles island (Giles island), was not definitely proved until the year 1889, when Captain Hemming Andreasen, in his yacht the *Rivalen*, not only saw the sound in clear weather, but actually penetrated it a short distance from the north. He called it Rivalen sound, and landed on Swedish foreland. Karl

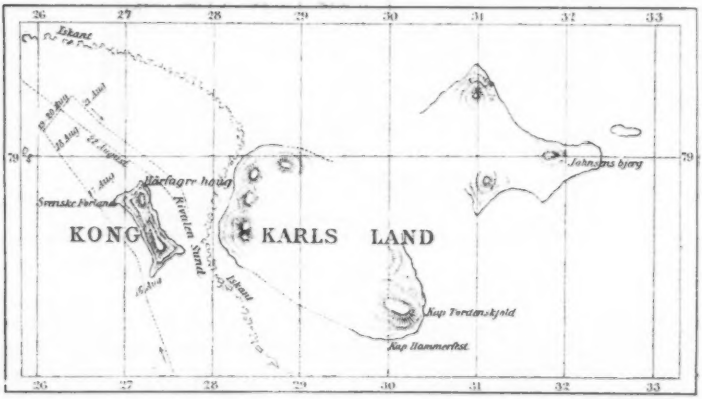

FIG. 14.—KING CHARLES LAND, ACCORDING TO ANDREASEN AND PETTERSEN.

Pettersen gave an account of Andreasen's voyage in *Ymer* * for that same year, and along with his paper printed a map upon which Swedish foreland is represented more accurately, both in respect of size and of shape, than on any previous map, as may be seen by a comparison of the facsimiles of Pettersen's map (Fig. 14) and the map accompanying this paper. The principal error on the former is the long promontory which runs out to the north-west on Swedish foreland.

It is, however, a mistake on Pettersen's part to put Hårfagrehaugen at the northern extremity of Swedish foreland, though I must in justice admit that he does so with some hesitation. The isolated mountain to which Johnsen gave this name (after the Norwegian king, Harald Hårfagre) really stands on King Charles island, and was seen by him from the summit of Mount Johnsen. I have stood on the same spot with

* K. Pettersen, 'Kong Karls Land i det östspitsbergske Hav,' in *Ymer*, 1889.

Johnsen's description in my hand, and I venture to affirm that there cannot exist a moment's doubt as to the identity of Hårfagrehaugen; there is absolutely no choice in the matter. The most convincing proof that Johnsen cannot possibly, by Hårfagrehaugen, have meant the northern extremity of Swedish foreland lies in the fact that the latter is not visible at all from Mount Johnsen, but is completely hidden by the intervening western plateau of King Charles island.

It is also a mistake, which has been repeated again and again, to put Cape Hammerfest on King Charles island; in reality, as the southern point of Firm Ice island, it belongs to Swedish foreland.

Previous to Andreasen's visit, Prof. W. Kükenthal, of Jena, on board the sealer *Cecilie Malene*, Captain Magnus Arnesen, had that same summer approached the islands four times, though without landing

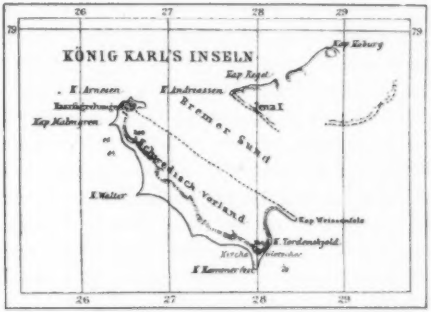

FIG. 15.—KING CHARLES LAND, ACCORDING TO KÜKENTHAL.

upon them. On the third and fourth occasion when he approached them the weather was beautiful and clear, and Kükenthal claims to have been able to see all over the archipelago from its north side. It is, however, plain that of King Charles island he saw nothing more than the extreme western portion. He sailed quite close to the western and southern shores of Swedish foreland, and it is upon the observations there made that he drew out the map which accompanied his paper, printed in 1890.* That map (Fig. 15), and the remarks which explain it, prove how easily even the most careful and conscientious observer may fall into error, unless he grounds his observations upon actual definite measurements.

* "Die von der Geographischen Gesellschaft in Bremen veranstaltete Forschungsreise in das europäische Eismeer," in *Deutsche Geographische Blätter*, xii. (1889), Bremen; "Bericht über die von der Geographischen Gesellschaft in Bremen im Jahre 1889 veranstaltete Reise nach Ostspitzbergen," in *Petermanns Mitteilungen*, 1890; "Forschungsreise in das europäische Eismeer," in *Deutsche Geographische Blätter*, xiii. (1890), Bremen.

In the first place, Swedish foreland, as shown on Kükenthal's map, is nearly three times too large, and extends considerably further to the south than the actual foreland does. Kükenthal condemns Andreasen's map, saying, "In my opinion this sketch-map is incorrect. There exists no such small island in the west as that which he shows." But in this Kükenthal is himself quite in error. In this particular, Andreasen's map answers more accurately to the real situation of the islands in the archipelago than does Kükenthal's own. As a matter of fact, the southern extremity of Swedish foreland lies in what is the middle point of Kükenthal's "Schwedisch-Vorland." Again, the northern eminence of Swedish foreland is wrongly identified with Hårfagrehangen, for this, as I have already shown, must be placed on King Charles island. It is no less an error to name the southern extremity of the foreland Cape Tordenskjold. Nor can the statement be accepted that the summits which Nordenskjöld and Dunér saw from the top of White mount in 1864 were nothing more than Hårfagrehaugen, as is proved by a single glance at the sketch by the latter. Further, the outline of Swedish foreland on Kükenthal's map is altogether misleading. The long narrow tongue of land marked "Cape Weissenfels" has no such existence; the bay is too deep at that point. The glacier which is represented at Cape Hammerfest is nothing more than a snow-drift. The height of the mountain there is considerably exaggerated, being given as 1180 feet instead of 590 feet, its actual height. The little island, Antarctic island, that lies north-west of the south-western extremity of the foreland finds no place at all in Kükenthal's map.*

If Swedish foreland, which Kükenthal sailed close alongside, is thus incorrectly mapped, it can hardly be expected that King Charles island, which he merely saw from the distance, should be laid down with any greater degree of accuracy. Kükenthal's Cape Coburg, the northernmost mountain, "with a flat-topped summit," is presumably Hårfagrehaugen. His Cape Regel has, in reality, no existence at all. And the somewhat dubious sound is the low ground that lies to the north of the pass between Mount Sjögren and Mount Tordenskjold. As the southern coast is only indicated by a dotted outline on Kükenthal's map, I need not further delay with it.

Kükenthal gave to the eastern island—that is, to King Charles island—the name of Jena island. I entirely fail to see by what right the German professor bestowed this name upon it. The island was originally discovered by Norwegian sealers or whalers, and they called it Giles island and Bear island. When Prof. Mohn drew up his map of

* The reason that Kükenthal's map has never been properly criticized by the Norwegian geographers seems to have been due, as I gather, to the death of Karl Pettersen happening just about that time. This is all the more to be deplored, because the English sea-chart of King Charles Land has been based upon Kükenthal's map.

King Charles Land, he did so on the supposition that the observations of the Norwegian skippers all had reference to the eastern part or the eastern island; but as regards the western part, seen by Nordenskjöld and Dunér, he did not know certainly whether it was or was not continuous with the eastern part, nor did he know, either, whether it had actually been seen by the Norwegian skippers. Accordingly, he called it Swedish foreland (Det Svenske Forland). Since, however, we now know that the foreland is separated from the chief island by a sound, Mohn's designation must, of course, be retained for the latter, with the slight substitution of "island" for "land," so that the general name of King Charles Land may be reserved for the archipelago as a whole. Thus, just as in the New Siberian group one of the islands is called New Siberian island, so in the King Charles group the largest individual island is called King Charles island, and in doing this we encroach upon no man's rights. Nay, the name King Charles island was thus used before us by the Englishman Pike. If any other name than this is to be given to the island, then unquestionably the Norwegian names are entitled to the priority, though neither of them is so appropriate as King Charles island. Had Prof. Kükenthal mapped the island or explored it, or even landed on it, his attempt to impose a new name upon it might then perhaps have had some claim to consideration; but as the facts really are, he possesses the rights neither of the discoverer nor of the explorer—nay, more than that, he saw merely a fractional part of the island.

The same remarks hold good, *mutatis mutandis*, of Kükenthal's renaming of the sound (between the foreland and King Charles island), Bremer sound; for Andreasen's map, in which the sound is called Rivalen sound, was actually published several weeks before Kükenthal's. Kükenthal claims the right to name this sound because he "discovered" it prior to Andreasen. As a matter of fact, the real discoverer was Altmann in 1872. Seeing, then, that Kükenthal neither discovered the sound nor visited it, nor mapped it correctly, it seems to me self-evident that to Andreasen, who was the first navigator, so far as we know, to sail its waters, and whose map of it unquestionably enjoyed priority of publication, clearly belongs the right to give it what name he pleases. It is for this reason that I retain the name Rivalen sound on my map accompanying this paper.

In 1897 King Charles Land was visited by Mr. Pike, who, on his return home, published in this *Journal* (April, 1898) an illustrated account of his voyage. The paper was not illustrated by any map; but I have no doubt that Mr. Pike's observations are embodied in the latest official English sea-chart * of the polar regions (Fig. 16). On this chart King Charles island is delineated with greater accuracy than

* 'Arctic Ocean and Greenland Sea.' No. 2282. London. 1898.

on any previous map, although Cape Altmann is not indicated sufficiently far to the west, so that Broad bay is too short measured from east to west. Mr. Pike calls it Victoria bay; but the name of Broad bay, which it has received on Mohn's map, deserves the priority. It is, I presume, an error on the part of the English lithographer that "Johnsen B." is placed at a bay instead of a mountain.* Swedish foreland is an exact

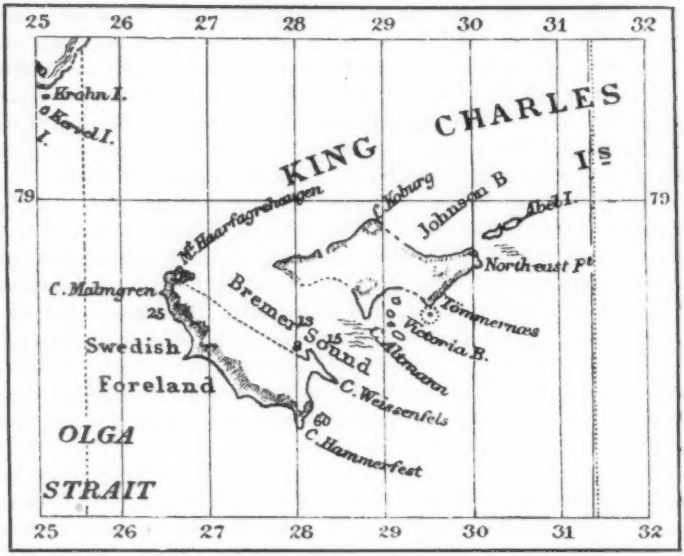

FIG. 16.—KING CHARLES LAND, ACCORDING TO ENGLISH SEA-CHART, 1898.
(*Facsimile, magnified.*)

reproduction of Kükenthal's map, with all its errors uncorrected, and in his text, too, Mr. Pike speaks of Hårfagrehaugen being situated at the northern extremity of the foreland. The real Hårfagrehaugen is shown in the two illustrations on p. 367 of Mr. Pike's paper. Mr. Pike's account of the islands, notwithstanding its brevity, contains a good deal of really useful information.†

(*To be continued.*)

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* Johnsen's B. on Mohn's map in *Peterm. Mitteil.* means Johnsen Berg. ("Berg" = mount.)

† In several places I read of "dolomite;" this is, I presume, a misprint for "dolerite." Mr. Pike's statement, that the position of Cape Weissenfels, as determined by an observation of latitude, agrees with its position as shown on the map, must surely be an error.

THE BATHYMETRICAL CONDITIONS OF THE ANTARCTIC REGIONS.

By HENRYK ARCTOWSKI, of the Belgian Antarctic Expedition.

THE scientific work of the Belgian Antarctic Expedition was commenced in the channels of Tierra del Fuego, and after the vessel left the pack they were concluded at Punta Arenas. It is thus impossible to discuss the physical geography of the antarctic regions in general without including the scientific results of the expedition of the *Belgica*.

The works of Murray, Neumayer, Fricker, and others,* give a general account of the state of our knowledge of the antarctic regions, and therefore I prefer to give in a series of articles a short summary of the results obtained by the Belgian Antarctic Expedition from the point of view of oceanography, geology, meteorology, and ice-conditions.

The *Belgica* had the advantage of navigating a region in which no previous bathymetric researches had been made, and her soundings have a special value (although their actual number was not great) because they were not taken at random. On the voyage from Staten island to the South Shetlands, a line of soundings was run nearly from north to south, giving a transverse section of the "antarctic channel" which separates the Andes from one of the projecting angles of Murray's hypothetical antarctic continent. In another place also, beyond the antarctic circle, and to the west of Alexander I. Land, we were able to obtain a series of soundings, some before entering the ice, the others on account of the drift of the vessel when imprisoned in the pack. The soundings on our way southward are given in the Table as Nos. 1 to 9, and those taken between 70° and 107° W. as Nos. 10 to 56, while the results are represented cartographically in the two maps.

The first map shows the probable arrangement of the depths to the south of Cape Horn and in the antarctic regions. Soundings Nos. 1, 2, and 3 prove that south of Staten island the continental shelf is very narrow, and terminates seaward in an abrupt slope, the greatest depth sounded (2209 fathoms) lying, in fact, very near the island. To the east,

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* G. Neumayer, 'Die Erforschung des Süd-Polar Gebietes.' Berlin: 1872.
„ "Ueber Südpolarforschung" ('Report of the Sixth International Geographical Congress, London, 1895').
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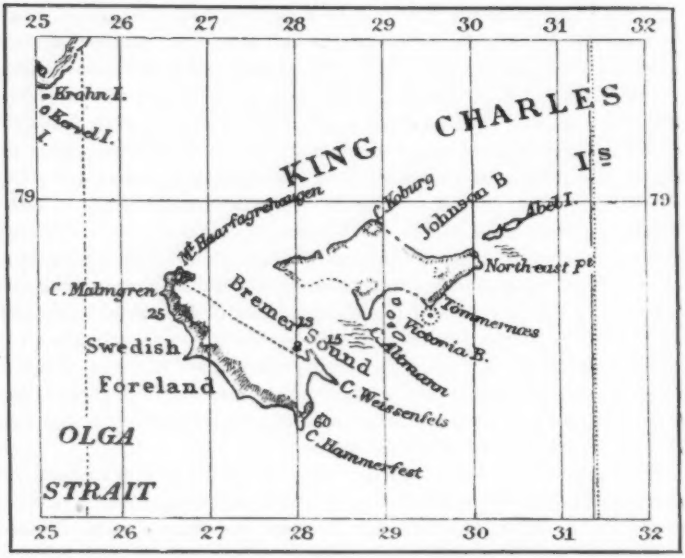

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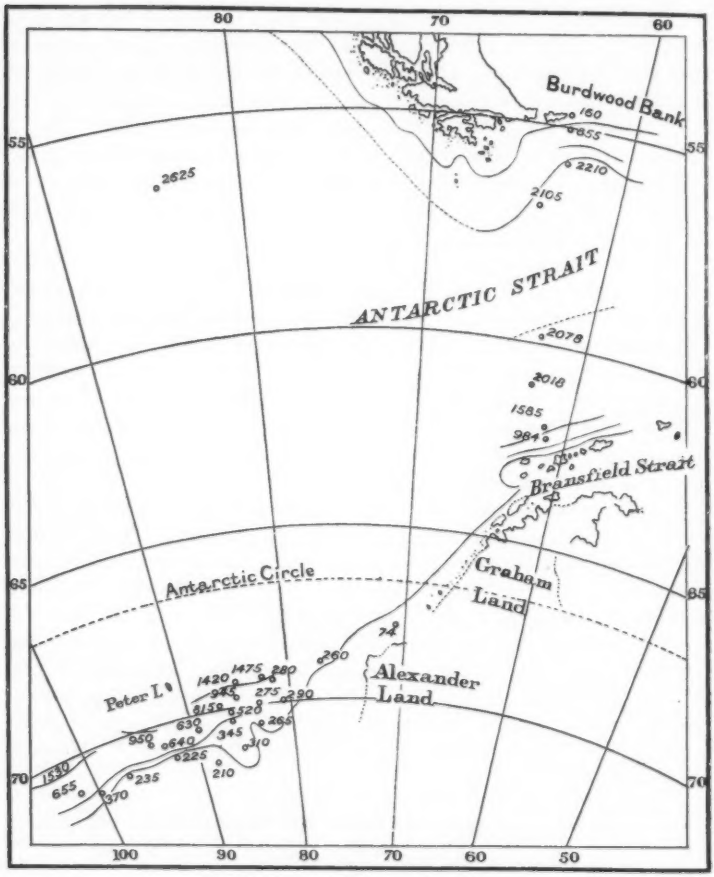
For bibliography, see T. Chavanne, 'Die Literatur über die Polar-Regionen der Erde' (Wien: 1878); and the 'Antarctic Number' of the *Scottish Geographical Magazine* (October, 1898).

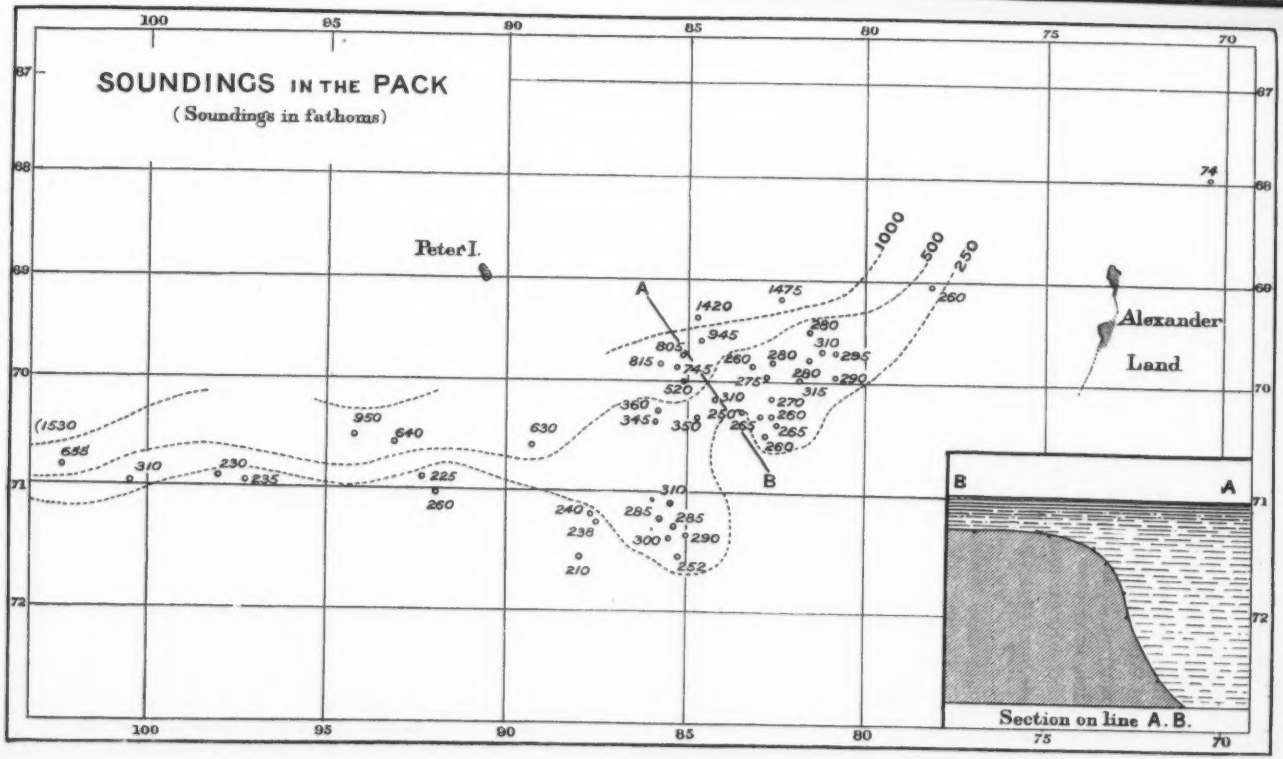
on the contrary, the continental shelf extends to a great distance as Burdwood bank.

Between the southern versant of the Andes and the mountain system forming the framework of the antarctic lands visited by the expedition, there lies a deep, flat-bottomed depression, the floor of

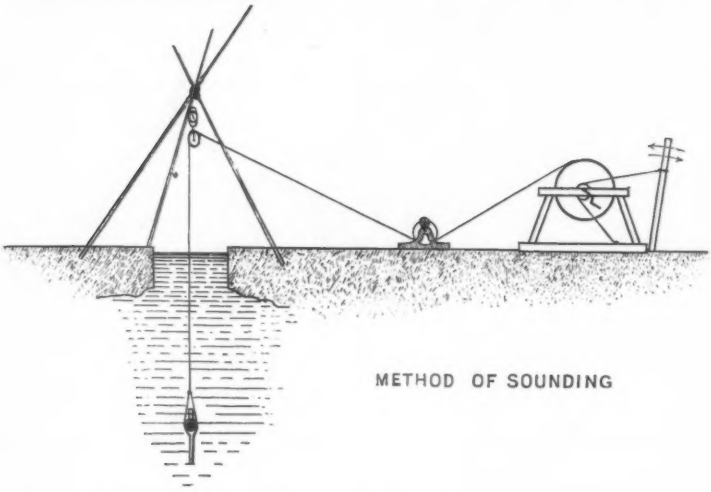


THE ANTARCTIC STRAIT

which rises gently towards the south, and not far from the South Shetlands an abrupt slope leads up to the rocky shallows near Livingstone island. The last sounding taken gave a depth of 2625 fathoms in 56° 28′ S., and 84° 46′ W., proving that the depth increases towards the Pacific ocean. As, on the contrary, the Sandwich group, South


SOUNDINGS IN THE PACK
(Soundings in fathoms)
Peter I.
Alexander Land
Section on line A. B.
A
B
1000
500
250
1475
1420
945
805
815
745
520
360
345
350
630
950
640
(1530
658
310
230
235
225
260
240
238
210
310
285
285
300
290
252
280
310
295
280
290
315
270
260
265
265
260
74
100
95
90
85
80
75
70
87
88
89
70
71
72

Georgia, and Shag rocks lie to the east, it seems probable that this great basin (called Barker basin on the chart in the *Challenger* Reports) does not extend to the east of these islands. In a note on the interest which attaches to the geological exploration of the lands in the far south, which I published in December, 1895,* I suggested that "Graham Land is connected with Patagonia by a submarine ridge, which forms a great arc extending between Cape Horn and the South Shetland islands, and that the tertiary chain of the Andes reappears in Graham Land." I maintain this hypothesis, which demands for its satisfactory demonstration, not only the geological study of the land, but also and



METHOD OF SOUNDING

chiefly a detailed bathymetrical map. The first step to this end has now been made.

The second map, showing soundings in the pack, is on a larger scale than the first, and shows the distribution of the soundings to the west of the land, and within the antarctic circle. It clearly demonstrates the presence of a continental shelf. The section along the line AB is extremely characteristic, showing distinctly that the submarine slope is discontinuous. The submerged bank, which terminates abruptly towards the ocean, has depths of from 300 to 200 fathoms, and further south the depths are probably still less. I shall not discuss the configuration of this submarine elevation, as one might imagine it to be from the soundings taken upon it, for the soundings are not numerous enough for this to be done profitably. But I cannot refrain from calling

* *Bull. Soc. Géol. de France*, [3], xxiii. p. 589.

attention to one point which seems to me of great importance. The edge of the plateau is indicated by the isobath of 300 fathoms, beyond which the depths increase very rapidly. Now, it is the 100-fathom line which is generally accepted as the limit of the continental shelf, and it would appear possible that in the antarctic regions the continental shelf had been submerged. The discussion of this interesting question would, however, lead us too far.

It is noteworthy that the soundings carried out by the *Erebus* and *Terror* to the east of Victoria Land and north of the ice-barrier discovered by Ross, also indicate the existence of a continental shelf with much greater depths to the north. Between the two there still remains a space of 60° of longitude to explore before one can say whether they are connected.

All the positions were fixed by M. Lecointe, and I am indebted to the kindness of this accomplished astronomer for the exact place of each sounding. The sounding-machine of the *Belgica* was constructed by Le Blanc at Paris, and is similar to that employed on the *Pola* by the Austrian expedition. During the wintering in the ice, M. de Gerlache had a simple but effective arrangement constructed on board, which was fitted up on the ice close to the ship, and only required a hole to be cut in order to allow a sounding to be made. It consisted of a wooden drum carrying the sounding-wire, a brake consisting of a cord and a strong piece of wood serving as a lever to regulate the descent of the weight, and two cranks on the axle of the drum to heave in the wire. A wheel of one metre in circumference, with a counter from the Le Blanc machine, allowed the depth to be read off. The line ran through a block attached by a dynamometer to three poles arranged as a tripod. The soundings and temperature observations were laborious, and it is due to the co-operation of MM. Amundsen, Tolewsen, Johansen, Melaerts, Vanrysselbergh, and of M. de Gerlache himself that it has been made possible for me to write these notes on the bathymetrical conditions of the antarctic regions.

TABLE OF SOUNDINGS.

Date.	Depth in metres.	Fathoms.	Latitude.	Longitude W.	No.
1898.			° ′	° ′	
Jan. 14	296	162	54 51	63 37	1
„ 14	1564	855	55 3	63 29	2
„ 15	4040	2209	55 51	63 19	3
„ 16	3850	2105	56 49	64 30	4
„ 18	3800	2078	59 58	63 12	5
„ 19	3690	2018	61 5	63 4	6
„ 20	2900	1586	62 2	61 58	7
„ 20	1880	1028	62 11	61 37	8
„ 28	625	342	64 23	62 2	9
Feb. 16	135	74	67 59	70 40	10
„ 19	480	262	69 6	78 21	11

Date.	Depth in metres.	Fathoms.	Latitude.	Longitude W.	No.
1898.			° ′	° ′	
Feb. 23	565	309	69 46	81 8	12
„ 24	510	279	69 31	81 31	13
„ 25	2700	1476	69 17	82 25	14
„ 27	2600	1422	69 24	84 39	15
„ 27	1730	946	69 41	84 43	16
Mar. 1	570	312	71 6	85 23	17
„ 1	520	284	71 17	85 43	18
„ 2	460	251	71 31	85 16	19
„ 4	530	290	71 22	84 55	20
„ 5	520	284	71 19	85 29	21
„ 9	554	303	71 23	85 33	22
„ 20	390	213	71 35	88 2	23
April 22	480	262	71 2	92 3	24
„ 26	410	224	70 50	92 22	25
May 4	1150	629	70 33	89 22	26
„ 20	435	238	71 16	87 38	27
„ 26	436	238	71 13	87 44	28
Sept. 2	502	274	70 0	82 45	29
„ 9	510	279	69 51	82 36	30
„ 14	480	262	69 53	83 4	31
„ 22	485	265	70 23	82 31	32
„ 26	485	265	70 21	82 52	33
„ 29	480	262	70 21	82 39	34
Oct. 7	480	262	70 30	82 48	35
„ 16	532	291	69 59	80 54	36
„ 19	580	317	70 1	81 45	37
„ 24	537	294	69 43	80 51	38
Nov. 2	518	283	69 51	81 24	39
„ 10	490	268	70 9	82 35	40
„ 28	459	251	70 20	83 23	41
Dec. 20	569	311	70 15	84 6	42
„ 22	645	253	70 19	84 51	43
„ 27	630	344	70 20	85 52	44
„ 29	660	361	70 15	85 51	45
„ 31	950	519	70 1	85 20	46
1899.					
Jan. 2	1360	744	69 52	85 13	47
„ 4	1470	804	69 50	85 12	48
„ 7	1490	815	69 52	85 32	49
Feb. 10	1166	638	70 34	93 17	50
„ 19	1740	951	70 30	94 12	51
Mar. 2	430	235	70 53	97 17	52
„ 5	425	232	70 51	97 57	53
„ 12	564	308	70 56	100 18	54
„ 13	1195	653	70 50	102 14	55
„ 23	4800	2625	56 28	84 46	56

THE OXFORD SCHOOL OF GEOGRAPHY.

For some time past there have been negotiations between the Society and the University of Oxford, with a view to the establishment there of a fully equipped school or institute of geography, which would supply a complete training in all departments of geography, not only to Oxford graduates and undergraduates, but to others who desired to avail themselves of such an opportunity. These negotiations have

terminated successfully, and it has been arranged that the school will begin operations next October, under the direction of the Reader, Mr. H. J. Mackinder. The Society will contribute £400 annually for five years out of the £800 required, and the school will be under the supervision of a joint committee of representatives of the Society and the University. At a recent meeting of the committee, the staff was appointed, Mr. Mackinder being the head of the school, and dealing specially with Historical Geography; Mr. A. J. Herbertson, PH.D., has been appointed assistant to the Reader, and will deal with Physical Geography, Cartography, and Surveying; Mr. H. N. Dickson has been appointed Lecturer on Physical Geography; and Mr. G. B. Grundy will lecture on Ancient Geography in 1899–1900.

The work of the school will include a course of systematic instruction primarily intended for graduates and other advanced students, with classes, demonstrations, and practical work in physical geography, cartography, and surveying. Courses of lectures will also be given with special reference to the historical and scientific teaching of the University. The work will be carried on for five days each week during term.

The lecture-room and laboratory will be in the Old Ashmolean Museum, the upper floor of which is being fitted with the necessary appliances.

The importance of this latest development in the efforts which the Society has been making for fifteen years to obtain adequate recognition of geography in higher education in this country, need not be insisted on. There is every reason to hope that the school will not only fill a useful function in the University, but have considerable influence on the position of geography in our public schools.

ADMIRALTY SURVEYS DURING THE YEAR 1898.

UNDER the orders of the Lords Commissioners of the Admiralty, eight of Her Majesty's vessels with three small hired steam-vessels, manned by 75 officers and 639 men, have been employed on hydrographical surveys on the home and foreign stations. A naval officer, assisted by officers of the Royal Indian Marine, has also been employed, with the sanction of the Admiralty, under the Indian Government.

The following is a brief summary of the work accomplished, as detailed in the report prepared for presentation to Parliament. The number of newly discovered rocks reported still increases; reports of two hundred and thirty rocks and shoals, which were dangerous to navigation, have been received at the Hydrographic Department, and were notified to the public by Notices to Mariners; 750 miles of coast have been charted, and an area of 10,435 miles has been sounded.

On the east coast of Scotland, a survey of the river Forth between Alloa and Port Edgar was completed.

The survey of Cromarty and Inverness Firths and their immediate approaches was taken in hand, and will be completed next year.

The set of the tidal streams was observed at several positions on the east coast of England.

On the east coast of England :—The following surveys were carried out.

Chatham, Upnor, Cockham and Short reaches were resurveyed on a large scale; this survey showed that the approach to the dockyard locks has less water than formerly, and that the area, which requires constant dredging to enable the basins to be used by battleships, has increased.

The shingles patch in the Duke of Edinburgh channel was resounded; its steady growth since 1882 has reduced the width of the Duke of Edinburgh channel from $1\frac{1}{2}$ mile to about $\frac{1}{2}$ a mile.

The Middle Swin was resurveyed; this passage way has of late years much contracted and shoaled. There is now little more than 19 feet on the bar at low water.

The survey of the Yorkshire coast was continued from the previous year, and completed from abreast of Huntcliff to a little eastward of High Whitby, the soundings being carried out to a distance of 5 miles from the land.

Holy island was surveyed on a large scale, and showed less water in the fairway of the harbour, and large changes in the forms of the sandbanks. It is sixty-five years since this place was surveyed.

Mouse Sand was resurveyed, and large changes were found to have taken place; the dry portion of the sand at low water had contracted to half its last recorded size.

On the south coast of Ireland, a new survey was made of the river Barrow; considerable changes were found to have taken place in the lower reaches. The Rusk and Arklow banks at their southern extremes were resounded, and were found to have extended to the south-westward.

The survey of the Scilly isles was resumed, and nearly completed.

On the west coast of Scotland :—A survey of Loch Ryan was begun, and will be completed in 1899. In the course of the work, a shoal of 15 feet was discovered in the entrance of the harbour.

The recently dredged areas in Plymouth and Portsmouth harbours have been closely examined.

On foreign and colonial shores :—The survey of the Strait of Belle Isle, Newfoundland, which was begun last year, was resumed and completed, and it is hoped, will be of great service to vessels navigating the strait, as marked differences in the depths in various parts of it exist, and will greatly tend to aid a vessel in a fog or thick weather.

The survey of White bay, which was begun last year, was resumed and completed.

In the West Indies, at Trinidad :—A survey was made of the Serpent's Mouth, together with a more extensive plan of the vicinity on a smaller scale. Deep-sea soundings in selected positions were obtained between Bermuda Island and Sierra Leone.

On the west coast of Africa, a survey of Sierra Leone was begun, and will be completed in the early part of next year.

On the west coast of North America :—Baynes sound and its approaches were re-surveyed, and a large plan of Port Augusta was also made.

The longitudes of Esquimalt and Vancouver were determined by exchange of telegraphic signals between those places and the McGill College Observatory at Montreal; these longitudes will establish on the Pacific coast, positions which will serve as initial points for meridian distances.

Magnetic observations with absolute instruments were taken at Coburg peninsula, near Esquimalt; Brockton point, Vancouver; Beak point, Denman island; and Maple spit, Baynes sound.

Nanaimo harbour was triangulated, and the survey will be continued next year.

In the Red sea and Mediterranean sea:—A series of current observations were taken in the large strait of Bab-el-Mandeb. The results of those observations have been published in a 'Report on the Under-currents of the Straits of Bab-el-Mandeb.' Unsuccessful searches were made for the reported shoals King Arthur and Akbar.

A detailed survey of the harbour of Alexandria on a large scale has been completed.

In Tasmania:—The river Derwent, from Government house to Risdon ferry, has been surveyed in detail on a large scale.

In New South Wales:—An examination of the eastern channel to Sydney harbour was made to ascertain the changes in depth since the survey in 1887.

Deep-sea soundings were taken in selected positions in the South Pacific, between Sydney and Auckland, New Zealand, and from Auckland to the eastward, across the deep depression south-east of the Tongan group, which was discovered in 1895. The limit to the eastward was defined, showing it to be a narrow gutter running north and south.

In the South Pacific:—Vavau and Haapai groups were surveyed, and from Vavau to Kao was surveyed on a smaller scale. Detailed plans were made of Ufulanga island anchorage, Neifu anchorage and its approaches, both on a large scale.

Many of the reported dangers between Vavau and Haapai, also between Letté and Kas islands, were disproved. Metis island, a volcanic island which originated from an eruption in 1875, has now completely disappeared; there is a breaking reef where the island formerly existed.

The edge of the bank on which the Nomuka group stands was completed on all sides, and also the northern edge of the bank on which Tongatabu stands. The North Star reef and Disney reef were searched for, but without success. It seems probable that the *North Star* touched on one of the reefs eastward of Kelefesia, and that Disney reef is identical with a shoal patch on the Falcon bank, which is in the same latitude, but 25 miles westward of the position, in which the "Disney reef" was reported.

A large area eastward of the Haapai group was sounded over during a search for the sandbank reported in that locality, but nothing was discovered.

Fanui Lai and Taku islands were surveyed on a small scale, and an ineffectual search made for breakers, which had been reported westward of Tongatabu.

A line of soundings was carried from Nukualofa to Sydney, passing over the position of Falcon island, and the report of its disappearance was verified. Falcon island has had even a shorter existence than Metis island. Emerging from the sea in 1885 as an island about 2 miles long and 160 feet high, composed entirely of ashes, it has been washing away ever since, and is now merely a breaking reef. After passing the position of Falcon island, a zigzag line of soundings was made to the westward and along the latitude of the dangers west of Honga Tonga; nothing suspicious was found. From thence to Sydney soundings were taken at close intervals.

Magnetic observations with absolute instruments were obtained at Neiafu and Lefuka in the Tongan group.

In China:—A detailed survey of Wei-hai-wei and its approaches was made, also a land survey of the west portion of the island of Leu-Kung-tau. The anchorage at Leu-Kung-tau was examined by boring in forty-two positions, to ascertain the depth of the mud and its consistency.

A triangulation of Tinghai, in the Chusan archipelago, was made, and the lower harbour was sounded.

In Queensland:—The survey was resumed inside the barrier reefs northwards of Cooktown, and completed from Morris island to 3 miles south of Claremont point.

Magnetic observations were obtained at Morris island, Burkitt island, and Cairus.

In India:—A plan was made of the port of Moulmein, and the greater part of the survey of the Moulmein river was completed by the end of the year.

The survey of the Gulf of Martaban was completed, which was begun in 1897. The soundings showed a great decrease in depth near the southern part of the gulf. This survey was delayed by an outbreak of cholera caused by drinking Moulmein river-water.

Magnetic observations were made in the Bay of Bengal; and the usual sounding and dredging operations carried out *en route* between Bombay and Moulmein.

During the year the Hydrographic Department has published ninety-eight charts and plans, and improved twenty-eight plates by the addition of forty new plans; 235 plates have been largely improved by corrections and additions; 4680 corrections have been made to plates by the engraver; and 32,200 charts have received minor corrections at the hands of the draughtsmen.

The number of charts printed for the requirements of the Royal Navy, for Government Departments, and to meet the demand of the general public, has, during 1898, amounted to 447,907.

SEVENTH INTERNATIONAL GEOGRAPHICAL CONGRESS: EXCURSIONS.

A CIRCULAR has been issued by the Bureau of the Seventh International Geographical Congress, giving full particulars of the excursions which have been arranged for before and after the meeting in Berlin, and accompanied by a copious bibliography of each of the regions to be visited. All the excursions before the Congress are so arranged, that those taking part in them will arrive in Berlin on September 27, in time for the informal meeting of welcome. Names for the excursions, accompanied by a deposit of 10s., must be sent in to the Secretary of the Congress at 90 Zimmerstrasse, Berlin, S.W., not later than July 15. The probable cost of each excursion has been calculated, and the whole of the payments will be made through the leaders, the members having no trouble of any sort with regard to travelling fares or hotel bills. The excursions are as follows:—

1. *To the Rhine and Moselle.*—Prof. Rein and Drs. Philippson and Kaiser, of Bonn, will conduct two one-day excursions: on September 19, from Bonn to the Siebengebirge; and on the 20th, from Bonn to Linz and Rolandseck, each day costing 6s., exclusive of hotel charges in Bonn. On Thursday, September 21, they will lead a five days' excursion, proceeding from Bonn to the Laacher lake, and spending the night at Niedermendig, proceeding next day to Gerolstein, the next to Manderscheid, the next to Bertrich, and on September 25 will reach Coblenz. Those who desire to do so may join Prof. Sievers' party, and proceed to Giessen on the 26th. The main excursion costs 70s., the extension to Giessen 15s.

2. *To the Rhine, Taunus, and Lahn.*—Prof. Sievers of Giessen will meet the party at Homburg on September 21, and, after crossing the Taunus ridge, stop for the night at Feldberg. Next day a further study of the Taunus will terminate at Wiesbaden; the following two nights will be spent at Bingen, one at Coblenz, and

on the 26th the excursion will terminate at Giessen. There will be an average of about five hours' walking on each day, and the expense will be 75*s*.

3. *The Vosges.*—Professors Gerland and Weigand and Dr. Rudolph will conduct a circular tour from Strassburg through the Vosges from September 21 to 25. Nights will be spent at Wesserling, Gérardmer (on the French side), and Colmar, and a special feature will be the study of the lakes of the district. The estimated expense is 70*s*.

4. *Thuringia.*—Professors Walther and Regel will meet a party (limited to thirty-five) in Eisenach on September 23 for a short tour through Thuringia, spending one night each at Bad Liebenstein, Elgersburg, Saalfeld, and terminating in Jena on the 27th, in time for the night express to Berlin. The cost is 70*s*.

5. *Rügen.*—A party, limited to 150, will meet Professors Credner, Cohen, and Deecke in Greifswald on September 22, proceed next day to Sassnitz, on the island of Rügen, where three nights will be spent while the coasts of the island are examined, and on the 26th reach Stralsund, and go on to Berlin next forenoon. The expense is estimated at 55*s*.

6. *East and West Prussia.*—These extreme easterly provinces of the German empire will be visited under the guidance of Professors Jentzsch and Conwentz. The party will meet at Königsberg on September 21, where three nights will be spent while excursions are made to points of interest, including the Kurische Nehrung. One night will be spent at Elbing, and the last two days in Danzig, whence the lower Vistula will be visited. This excursion will deal largely with deltaic and glacial formations, and interest will be given to it by the search for amber and interglacial fossils. The cost will amount to £5.

7. A short one-day excursion will be made on Sunday, October 1, from Berlin, to see the glacial deposits at Rüdersdorf.

8. The final excursion starts from Hamburg after the Congress on October 7, for the special study of the glacial formations of the North German Plain, under the direction of Prof. Wahnschaffe and Drs. Keilhack and Müller. The stopping-places will be Lübeck, Stettin, and Stargard, where the excursion terminates on October 11. The cost will probably amount to 74*s*.

It is to be noted that the expense of the excursion is reckoned in each case from the place at which the party meets, and to the place at which it breaks up.

THE MONTHLY RECORD.

THE SOCIETY.

Geography at the Universities.—Mr. H. J. Mackinder, the Reader in Geography at Oxford, reports as follows: "My work at Oxford has been generally similar to that of previous years, but the attendance of students has been the largest since the readership was established. In the Michaelmas Term I lectured twice a week to 79 men from eighteen colleges, and to 16 ladies from three colleges. During the Hilary Term the numbers increased to 93 men from nineteen colleges, and 13 ladies from three colleges. In London I have lectured on the Teaching of Geography before the Association of Principals and Lecturers of Training Colleges, and at the Winter Meeting of Students, chiefly teachers,

held by the College of Preceptors. I have also lectured on geographical subjects at the London School of Economics. Much of my time during the past winter has been occupied with preparations for the more extended system of geographical teaching which, through the co-operation, now assured, of the Society and the University, is to be introduced at Oxford during the next academic year. Arrangements have been made to place at our disposal excellent rooms on the upper floor of the old Ashmolean Museum. Our chief difficulty in the earlier stages will relate to the adequate supply of apparatus and other material. We should be very grateful for help in this matter from any Fellow of the Society." Mr. Yule Oldham, the Reader at Cambridge, reports as follows: "The past academic year has been one of steady progress. My usual courses of lectures have been attended by larger classes. Of University extension lectures, I have delivered courses at Hull, Stepney, Market Drayton, and Wellington, which have been attended by audiences numbering over four hundred. In nearly every case the interest aroused has been such that the attendances have steadily increased throughout the course, resulting in strong requests for further series of lectures. With regard to the future, I have made arrangements for a considerable extension of my work here in the coming academic year, of which I trust to be able to report next summer a successful result."

EUROPE.

The Genesis of the Severn.—In a paper published in the April number of *Natural Science*, Mr. S. S. Buckman endeavours, on the lines laid down by Prof. W. M. Davis, to trace the various stages in the development of the river systems of Southern and Western England, which led to the growth of the Severn as an independent stream. The view that the present Severn and its branches originally formed part of the Thames system is not a new one, for Mr. Buckman remarks that some dozen years before Prof. Davis put forth his views on the subject, Dr. T. S. Ellis, of Gloucester, had imagined the possibility of rivers flowing across a non-existent Severn valley; Mr. Buckman, however, goes into greater detail than his predecessors, beginning from the supposed original system of dip-streams flowing south-east from Northern and Central Wales into the present Thames valley, and endeavouring to show the succession of changes which have resulted in the state of things now observable. As he himself allows, his statements are decidedly speculative, and only in a few cases are arguments brought forward in support of them, but the paper is suggestive, and will, it is to be hoped, lead to the accumulation of further evidence on the subject. Mr. Buckman considers that the Evenlode and the Kennet were formerly the most important branches of the Thames, but that the former was the larger and gained in importance by robbing the Kennet of some of its feeders. It is even supposed to have included within its basin portions of the modern Trent, Dove, and Mersey. In the second phase of the Thames system, before the encroachment by the Severn, the drainage had been collected, Mr. Buckman thinks, into five principal channels just east of the present Severn. These were captured one by one as the new stream draining to the south-west gradually worked its way back, while in their abandoned middle courses the present left-bank tributaries of the Severn were developed. The most important of these, as being the

earliest developed, we should expect to find opposite the Taff and the Rhymney. That this is not so, but that the longest is to be found further north in the Avon, Mr. Buckman explains by the fact that the original Usk valley, now occupied by the Avon, was the deeper, having received the larger drainage. The fact that many of the tributaries of the Avon flow more or less in opposition to its stream is instanced as an indication of the eastward flow of its predecessor.

Movement of Population in Northern Baden since 1852.—This subject is dealt with in an exhaustive way by Dr. Carl Uhlig in a recent issue of the *Forschungen zur deutschen Landes- und Volkskunde* (vol. xi. part 4). Before giving the results of his inquiries, the writer explains carefully the methods employed, which are such as to present the facts in as natural a grouping as possible. The region dealt with is not, Dr. Uhlig allows, a natural unit, or even a group of such; but in order to make it so it would be necessary to include portions of neighbouring provinces, and the labour of searching the records of four separate statistical departments would have been out of proportion to the results gained. Within Northern Baden, which he considers to end at the valley of the Kraichbach, Dr. Uhlig bases his study on the three natural divisions of the country, viz. the Rhine-plain, the Odenwald on its eastern flank, and the terrace-land of Swabia and Franconia. The ultimate subdivision is into parishes, but sometimes these are further divided, as, *e.g.*, when a single parish extends over a portion of the plain and also of the hills, as is often the case on the western margin of the Odenwald. This strip of country is therefore treated as a transition region, which Dr. Uhlig designates the Bergstrasse He also, in reckoning the density of population, places the forest area in a category by itself, as in Baden a large proportion belongs to the public domain, and the part of the population to which this gives employment is exceedingly small. A due proportion is, however, deducted from the population of the separate parishes where these include a class of people wholly or in part devoted to forestry. Deductions from area are also made in the case of barren lands, and in certain instances in that of water expanses, though both these categories are too small to be shown on the maps. Dr. Uhlig treats first of the changes in density of population which have taken place since 1852, and finds that an increase is principally to be noted in the west—in the Rhine plain and the adjoining hills—while a decided decrease occurs only in the mountainous parts of the two last main divisions. We thus have to do with a decrease in the uplands, less favourably situated from a climatic point of view, and an increase in the lower country, whose geographical and climatic position is more favourable, and which possesses important industries and trade facilities. The influence of movement from the country to the town is also apparent. In the latter part of the paper, Dr. Uhlig treats of the actual density in 1852 and 1895, and examines in detail the causes of change observable in each of the separate regions. He finds that almost every instance of increase is attributable to the great impetus which has been given to trade and industry of late years, this being particularly noticeable in the Rhine valley, and above all in the districts lying within the influence of Mannheim.

The Roman "Limes" in South Germany and the Fir Woods of Franconia.—A paper on this subject, by Dr. Robert Gradmann, appears in the third number of *Petermanns Mitteilungen* for the present year. In the first section of the paper the writer traces the course of the Roman "limes Germaniæ superioris" and "limes Rætiæ," the boundaries of the empire on the side of the independent Germans, as determined by recent investigations, and points out the difficulties which arise in the attempt to account for the line taken. From Miltenburg, on the Main, the German *limes* runs a little east of south to the vicinity of Lorch, in the Rems valley, whereas its continuation, the "limes Rætiæ," makes a sharp

angle with it near that place, running for a long distance considerably north of east. By cutting off the sharp angle made by the two lines, the Romans would not only have shortened the distance very considerably, but, by following various water-partings instead of cutting across the streams at right angles, would have encountered much less difficulties in the construction of the work. Dr. Gradmann dismisses such explanations as those which suppose the boundary determined by its parallelism with the courses of the Neckar and Danube; by the desire of the Romans to take their opponents on two flanks; and so on; but thinks an explanation may be found in the distribution of forests in the region in question. The western limit of the coniferous forests of Franconia, as laid down by Tscherning, coincides remarkably with the corresponding portion of the Roman *limes*; and though it is not so easy to draw a definite boundary in the Bavarian section, Dr. Gradmann's researches lead him to conclude that the same parallelism may be observed here. That the former limit of coniferous forests did not deviate to any great extent from the line assumed, is shown by the fact that place-names directly connected with conifers occur only to the north of that line, while they are particularly plentiful in its immediate neighbourhood. Dr. Gradmann carefully examines the causes for the parallelism thus ascertained, and comes to the conclusion that it is not due to the destruction of the forests by the Romans to the south of the *limes*, or to the encroachment of the forest from the north, but that the Romans found the distribution of forests much as it is at the present day, and constructed their frontier accordingly. That distribution seems really due to the composition of the soil, the beech thriving especially in soils composed of limestone and loam, while the fir and its allies flourish in the sandy and gravelly soils met with in the region of the *Keuper*. Dr. Gradmann examines the history of the settlement of Southern Germany, and shows how forest tracts, like that occupying the angle of the Roman *limes*, were long avoided, so that the hitherto problematical course of that line was really the only natural one.

ASIA.

Dr. Sven Hedin's Work in Central Asia.—We have received from Dr. Sven Hedin some details respecting the forthcoming publication of the scientific results of his former journeys in Central Asia, as well as an account of his plans for his new expedition. In addition to his own text, which will include an index and glossary of 3000 geographical names in East Turkestan, the work alluded to will contain memoirs on petrography by Dr. Bäckstrom; on the samples of sand collected, by Baron de Geer; algæ by Prof. Wille; phanerograms by Mr. Hemsley of Kew; and meteorology and hypsometry by Dr. Nils Ekholm. The topographical maps have been worked out with great care by Dr. B. Hassenstein, and will supply a large amount of new information respecting Eastern Turkestan. Dr. Sven Hedin hoped to start for Kashgar about June 27, and will attempt to reach that place by a new pass north of the Terek-davan. His first task will be the mapping of the Yarkand-daria, after the completion of which he proposes to proceed to Lob-nor, where he will spend the winter, carrying out levelling operations in order to test the possibility of past changes in the position of the lake. Another part of his programme is the study of the old river-courses of the Cherchen-daria and other streams of the Tarim basin, while in the summer of 1900 he proposes to turn his steps to Northern Tibet, paying special attention to its geology. He hopes to make his way to the important Gangri range, and to spend the winter at an elevation of over 16,000 feet in order to study the climate of Tibet at that season. In the spring of 1901 he hopes to return *viâ* India.

Ethnography of Turkestan and Tibet.—The second volume * of the important work presenting the results of M. Dutreuil de Rhins' unfortunate expedition to Central Asia has now appeared. The first, containing the narrative of the journey, has already been noticed in the *Journal*. The part now before us deals with the ethnography and sociology of Chinese Turkestan and Tibet, and in it M. Grenard, M. de Rhins' travelling companion, presents a useful summary of the manners and customs of the people of those countries, their occupations, family life, religion, commerce, and so on, with a degree of minuteness hardly before attempted. We cannot here enter into details on these subjects, but one or two chapters of the work which offer a more general interest may be briefly touched upon. One of these treats of the population of Chinese Turkestan from the point of view of its origin and affinities—a subject of much difficulty by reason of the very scanty information to be obtained from early writers on the country. While many travellers dwell on the heterogeneous character of the sedentary population of Turkestan, M. Grenard finds, in spite of many differences, a certain homogeneity which inclines him to consider the people as really forming an ethnical unit. For want of a comprehensive name, he is obliged to apply to them the common expression Turks, though this must not, he says, be taken as prejudging the question of their race, but merely as denoting that they speak a Turki language. He examines the accounts of the Greek,† Roman, and Chinese writers, and finds in the statements of the last named confirmation of the idea that the basis of the population, at least within historic times, has always been Aryan, an idea also borne out by the physical character of the people, especially the total absence of oblique eyes. M. Grenard is not the first to hold this opinion, for Shaw in his 'High Tartary' also lays stress on the Aryan type of the population. An interesting chapter is devoted to ancient and modern trade and trade routes, those in use in the time of the Han dynasty being clearly described. M. Grenard points out the strategic and commercial importance to China of a re-opening of the Lob-nor route, then a regularly frequented one. The concluding chapters of both sections of the book contain some thoughtful remarks on the present political situation in Turkestan and Tibet. In spite of the defects in the Chinese administration, the people of the former are not yet ready, M. Grenard thinks, to accept Russian sovereignty, though this will no doubt come in time. When no longer able to avert this contingency, Great Britain will, in his opinion, be forced to establish a protectorate over Tibet, where Chinese influence is almost *nil*, and will thus secure repose for India behind a colossal rampart of mountains, besides strengthening her position with regard to the Yang-tse valley.

Persian Trade-Routes.—A question of special importance at the present time—the opening up of Persia to foreign trade by the improvement of means of communication in the country—was dealt with in February last before the Society of Arts, by Mr. A. Hotz, whose paper is printed in the *Journal* of that Society for March 10. After remarking on the strange fact that an immense country on the high-road between the East and Europe is totally unprovided with efficient means of carriage either by land or water, the author gives a list of the trade-routes—mere mule-tracks—now existing, five being from the south and three from the north. Apart from some short roads near Teheran, the only cart-roads yet existing are (1) Teheran to Kasvin, 96 miles; (2) Teheran to Kum, 97 miles; (3) Meshed to Askabad, 150 miles, 30 of which are on Russian territory. Concessions for other

* 'Mission Scientifique dans la Haute Asie.' Deuxième Partie. Paris: Leroux. 1898.

† M. Grenard goes into some detail to prove that the Sakas of the Greek and Roman writers did not inhabit Chinese Turkestan, unless the term is understood in a very general sense, similar to that attached to the term Scythians.

roads have been granted, but circumstances have in most cases hindered the carrying out of the projects. The most important of these was for a prolongation of the Teheran-Kum road to Ahwaz, on the Karun, which would have secured the shortest and least difficult route from the capital to the sea, and opened up the only well-watered province of Persia. The concession was obtained by the Imperial Bank of Persia, which established a service of diligences between Teheran and Kum, but, after executing a survey of the proposed road, was obliged by financial considerations to give up the undertaking. In the north, on the contrary, Russia, whose trade—principally in cottons and sugar—has of late years made great strides in that part of the empire, has persevered in the construction of a road from Kazvin to Resht and Pir-i-Bazaar, in spite of the difficulties encountered in crossing the Elburz ranges, and the work will certainly be completed by the autumn of the present year. On the opening of this route it should be possible to make the journey from London to Teheran within a fortnight, and this time would be further reduced by about four days when the Petrovsk-Baku line is opened. It will be impossible to utilize the line of the road for a railway, but the rapidly approaching Russian lines will, no doubt, in time be prolonged within Persian territory. Meanwhile a step forward in providing communications from the south has been taken by the arrangement entered into last year between a British firm and the Bakhtiari tribes for the opening of the much-discussed trade-route from Shuster to Isfahan through their country. The increased trade at Ahwaz and Shuster, which may result from the opening of this route, may lead to the resumption of the Ahwaz-Teheran project, which will always remain the ultimate aim.

The Eruption of Mayon in the Philippines, 1897.—In order to preserve a record of the principal phenomena connected with the destructive eruption of the great volcano of Mayon in 1897, Father José Coronas, S.J., has brought together, in a brochure published by the Manila Observatory, all the accounts of eye-witnesses which he has been able to collect. The volcano is situated in the south-east of the island of Luzon, in the north of the province of Albay, and is remarkable for its regular conical form, rising to a height of 8274 feet above the sea from relatively low surroundings; whilst, owing perhaps to the incoherent and fragmentary nature of the lavas of which it is composed, there is a complete absence of secondary cones on its flanks. Before describing the recent catastrophe, Father Coronas gives a brief review of all the previous recorded eruptions, paying especial attention to those which have occurred since 1884, the year in which the meteorologico-seismical service was established in the archipelago. The earliest recorded is that of 1616, mentioned by Spilbergen; but the most memorable, both on account of its magnitude and of its destructive effects, is that of 1814. That of 1881–82 was remarkable for its duration, but since 1814 no single eruption has equalled in importance that which forms the subject of the present publication. Several of the eruptions of Mayon have been preceded by earth-tremors, and this was also the case in 1897, considerable shocks with movements of oscillation and rotation, especially the former, having been experienced in the province of Albay on the night of May 13, the centre of action being situated in the island of Masbate, south of that province. Unusual signs of activity were first observed in the volcano on June 22, and these gradually increased until the 25th, on which date, especially after midday, it presented a terrible aspect, vomiting forth a dense column of smoke and ashes, which darkened a great part of the sky in the vicinity. An illustration is given, showing the appearance of the mountain at this time. The most violent period of the eruption lasted seventeen hours, during which an immense quantity of lavas and volcanic bombs were poured out. A map is given, showing the limits of the destructive action of the volcano, which was principally felt towards the east and

south-east, the lava-streams extending farther in these directions than in any other. Seven villages were wholly or in part destroyed by them, while much damage was also done in the town of Libog, at a horizontal distance of 6 miles from the summit. The late eruption was remarkable for the quantities of *lapilli*, ashes, and dust discharged, which fell over a large area of south-east Luzon, principally to the north-west of the volcano. The approximate limits of the fall of ashes are shown in a second map, the area affected measuring about 200 miles by over 100.

AFRICA.

Major Gibbons on the Zambezi.—Writing to us on March 10, Major Gibbons describes the course of his expedition down to that date. He was then, with the advance guard of his party, at Kazungula, at the Kwando confluence. During the ascent of the Zambezi great difficulties had been encountered, owing to the many rapids. The work of transporting the steamer and goods past those of Kebrabasa, a distance of 65 miles, was especially heavy, some parts of the route being as rough and hilly as Captain Gibbons had seen anywhere. In all, 537 porters were employed on the work. After the steamer had been put together at Chikoa, Captain Gibbons determined to proceed up the river with a load of four and a half tons (including passengers), and send back the steamer to assist the other two boats in the transport of the rest of the goods, it having been found impossible, owing to the strength of the current, to carry all in one journey. The work of bringing up the goods to the Kafukwe was entrusted to Mr. Muller, a man of indomitable energy, who, however, became prostrated with dysentery, so that the task devolved on Mr. Weller, who had brought back the steamer from the upper river. Owing to the delay thus occasioned, Captain Gibbons felt it necessary to abandon the idea of proceeding to the great lakes by the Kafukwe, more especially as the route, though interesting, would have led in great part over known ground. During his ascent of the Zambezi in the *Constance*, he had carefully mapped the river, which is incorrectly laid down on published maps, the rapids especially being very imperfectly shown. They proved much more numerous than had been anticipated, and, it being low-water, the channel was much blocked by rocks. The gorge a little above Zumbo, called Kariva by Livingstone, is also known, like that on the lower river, as Lupata; and as both names mean simply "gorge," and are already in use elsewhere, Captain Gibbons suggest the name "Livingstone gorge" for the one near Zumbo, which is one of the grandest and most picturesque pieces of scenery on the Zambezi. The name is not yet borne, he says, by any spot in Africa worthy of it. Navigation on the middle Zambezi ceases at the Molele rapids, about 20 miles below the Guay confluence. Above them a great number of rapids —some very severe—occur until 40 miles above the Victoria falls. After towing the steamer through nineteen rapids in little more than 20 miles, Captain Gibbons decided that any attempt to take it further was useless. Before turning it had passed through a most inhospitable gorge, almost devoid of life, and flanked by high sombre walls of rock, surmounted by huge blocks of basalt with high mountains beyond. It received the name of "the Devil's gorge." From the Sichiwene cataracts, which fall about 12 feet in two drops a few yards apart, Captain Gibbons proceeded to Sesheke, and thence by a new route to Lialui, where he made arrangements with Lewanika for the future course of the expedition. He hoped, in conjunction with Captains Quick and Hamilton, to do some exploration westwards, on the Kwando, Okavango, and Kwito, and then to ascend the Zambezi to its source. We have received Captain Gibbons's map of the middle Zambezi, which promises to supply valuable additions to our knowledge.

Mr. Mackinder's Expedition to Mount Kenya.—Mr. H. J. Mackinder

has lately started on an expedition to Mount Kenya, with a view to a thorough scientific examination of the mountain and its vicinity. He is accompanied by Mr. Hausburg, who is defraying a considerable part of the expenses of the expedition, as well as by two Swiss guides and two natural history collectors. A sum of money has been placed by our Society at Mr. Mackinder's disposal, and we look forward to good results from the exceptional facilities for research which he will enjoy. He proposes to camp at an elevation of 16,000 feet, and, if possible, to ascend to the summit, which has not yet been reached, though an altitude of 17,000 feet was attained by Dr. Gregory from the west, while the foot of the final peak was reached by Dr. Kolb from the east.

German Scientific Researches on Lake Nyasa.—We learn from the *Verhandlungen* of the Berlin Society, that the Prussian Academy of Sciences has set aside a sum of money for the thorough botanical and zoological investigation of the neighbourhood of Lake Nyasa. The expedition will be under the leadership of Dr. Fülleborn, who has already resided as doctor at Langenburg, and he will be joined, as botanist, by Dr. Goetz, who will proceed to the lake overland from Dar-es-Salaam, taking with him the necessary scientific equipment.

AMERICA.

M. Romero's Work on Mexico.—Mr. M. Romero's work on 'Coffee and Indiarubber Culture in Mexico,'* a copy of which has recently been presented to the library, is of importance both geographically and commercially. The first 280 pages, forming the greater part of the volume, are occupied by "Geographical and Statistical Notes on Mexico"—also published as a separate volume—and constitute a compendium of facts on the geography and statistics of the country. Part I. of these "Notes"—Geography—embraces information on a variety of aspects of the subject, including location, boundaries, and area; geology; mining; orography; hydrography; climate; flora; cattle-raising; fruits; irrigation; fauna; ethnology; languages; population; education; the city of Mexico, its climate and meteorology, etc. Mexico, possessing such diversity of climate, is capable of raising most of the agricultural products of the world. The mean temperature in the hot region varies from 77° to 82° Fahr., seldom falling below 60°, but often rising to 100°, and in the sultry districts of Veracruz and Acapulco occasionally to 104°. The temperate zone, described as one of the finest climates of the world, is located from 3000 to 5000 feet above the level of the sea, and embraces all the higher terraces, and portions of the central plateaus themselves. The mean temperature is from 62° to 70° Fahr., varying not more than 4° to 5° during the season. The cold region is located from 7000 feet above the sea-level upwards, and has a mean temperature of from 59° to 63° Fahr. Most of the grand central plateau is located in this region. The rainfall is about one-fifth that in the temperate zone. The most thickly inhabited portion of the country lies in the central plateau, and is high above the level of the sea. It is pointed out that the climatic conditions of Mexico are undergoing great changes on account of the destruction of the forests. Owing to the difficulty of transporting coal, the population has had to depend upon charcoal for fuel, which has in the course of time denuded the mountains, thus changing the climatic conditions of some parts of the country. The Indian population has been decreasing since the beginning of the century. According to the last census,

* 'Coffee and Indiarubber Culture in Mexico. Preceded by Geographical and Statistical Notes on Mexico.' By Matias Romero. New York and London: G. P. Putnam's Sons. 1898.

that of 1895, the population of Mexico was 12,570,195. Among the more important matters dealt with in the statistical portion of the work may be mentioned railways. The mileage of railways and tramways in Mexico in 1895 is given as 7,388,158, presumably 7388·158, although it is somewhat unusual to measure railways to the thousandth of a mile. Not the least important part of the work is the section dealing with the drainage of the valley of Mexico. This important undertaking is now practically finished. The sewage of the city of Mexico, which has hitherto been discharged into Lake Texcoco—a lake with no outlet and liable to floods—will now, together with the surplus waters, be carried by means of a canal 43 miles in length, and a 6-mile tunnel through the mountain range, to a river, and so to the Gulf of Mexico. The completed system is stated to have cost $20,000,000. The author's experiments in coffee and indiarubber raising were made some years back in the district of Soconusco, in the state of Chiapis, in South-Eastern Mexico. In his manual on the subject, forming the latter portion of the volume, he discusses fully the various aspects of the subject of coffee and indiarubber cultivation, especially with regard to Mexico. The district of Soconusco seems, both as regards soil and climate, to be admirably adapted to the cultivation of coffee, but at the time of writing (1874), the scarcity of labour here was the principal drawback. The author is of opinion that coffee-growing will continue to be one of the most lucrative branches of agriculture in Mexico. With regard to the cultivation of indiarubber, the author speaks from experience, and sets forth the advantages of Soconusco, where he had a fair-sized plantation. Lowlying land, where the climate is hot and damp, is best suited for this cultivation. He takes a very favourable view of the future results of rubber culture in Mexico.

Dr. Sapper on the Physical Geography of Central America.—Dr. Karl Sapper, whose previous contributions to our knowledge of the geography of Central America are well known, has brought together, in a supplementary number of *Petermanns Mitteilungen* (127), the bulk of the material collected by him down to 1897, during his journeys in Southern Mexico, Guatemala, Honduras, and Salvador. He thus presents a systematic sketch of the geology, orography, and hydrography of the whole of Northern Central America, down to the isthmus between the Gulf of Honduras and Fonseca bay. The first section of the brochure records in detail the geological facts collected, chiefly in the form of descriptions of profiles along the various routes followed by Dr. Sapper in his extensive wanderings; the profiles themselves being reproduced at the end of the paper. No attempt is here made at generalization, this section being intended merely to supply students with a basis on which to found their own conclusions. In the second section an attempt is made to present a more comprehensive view of the structure of the country, though, as Dr. Sapper remarks, our knowledge is not yet extensive enough to allow a complete picture of the geological history to be drawn. Having first described the distribution in Central America of the different geological formations, from the archaic rocks, which, in continuation of those of the Western Sierre Madre, form, especially in Guatemala, the groundwork of the whole, to the recent alluvial and other deposits, Dr. Sapper passes to the consideration of the general structure of the country. This appears to be unusually complicated, the mountainous country being traversed by an extraordinary number of breaks and faults, whilst in the south the eruptive masses have covered all but a small fraction of the original formations. The general structure of the country is asymmetrical, for Palæozoic rocks are entirely wanting south of the archaic zone in Guatemala and Honduras, and an extraordinary diversity of geological history is also observable in detail. Our topographical knowledge is likewise insufficient to allow the present surface features to be explained fully on tectonic grounds, still the general character of

separate districts can be referred to distinct types. Thus Yucatan and the adjoining portions of Guatemala and British Honduras are plateau-lands where folding and fracture have played a comparatively small part. The mountains of North and Central Chiapas are composed of table-like masses, in which the strata are sometimes thrown up at a steep angle. The Palæozoic and archaic formations take the form of folded ranges, and so on. A section is devoted by Dr. Sapper to the hydrography in its relation to geological structure, while remarks on the soils represented and copious tables of altitudes complete the paper. There are two large-scale (1 : 1,100,000) maps of Northern Central America, one showing contours of altitude in ten gradations of colour, the other the distribution of the various geological formations.

Further News of Dr. Steffen's Expedition.—In our last number we recorded the discovery by Dr. Steffen of three large rivers debouching into Baker channel on the west coast of Patagonia, and stated that it was the intention of that traveller to attempt to penetrate the Cordillera by the most important of the three the Rio Baker. From a note published in *Globus* (vol. 75, p. 344) it appears that Dr. Steffen has succeeded in the attempt, having made his way to Lake Cochrane before the end of February. The Rio Baker was ascended for some 45 miles, when a fall was encountered, which put a stop to navigation by the boats. Continuing his journey on foot, and occasionally making use of the canvas boats, Dr. Steffen left the main stream and ascended a tributary, which proved to issue from a lake. The main stream comes from the north, but the tributary from the north-east. The deep valley of the latter contains a number of small lakes, and finally Lake Cochrane, which is long and narrow and somewhat curved. The Rio Baker is one of the largest streams of Chili, and has possibly the greatest volume. The Lago Buenos Aires seems to belong to its system. Deer were met with in large numbers, and, having apparently never seen a human being before, were easily shot. The weather had been fine throughout, the district being evidently much drier than Chiloe and Valdivia. The vegetation is less luxuriant, and at Lake Cochrane many Chilian trees appear merely as brushwood.

AUSTRALASIA AND OCEANIC ISLANDS.

The Jesup North Pacific Expedition.—An outline of the field-work of the Jesup North Pacific Expedition during 1898 is given in recent issues of *Science*. On both the Asiatic and American continents ethnological, as well as archæological, work has been done. Ethnological investigations were conducted by Mr. R. B. Dixon in a little-known district on the west coast of Washington, extending from Cape Flattery to Grey's Harbour, about 100 miles in length, and inhabited only at a few points. The Indians of the coast to the south of Cape Flattery consist of two tribes—the Quilleute and the Quinault. The linguistic material collected shows the Quilleutes to be of Chemakum origin, while the Quinaults are of the Salish stock which occupies most of the territory about Puget sound. The archæological work in British Columbia carried on by Mr. Harlan I. Smith during the past two years has mainly been directed to—(1) an examination of the archæology of the southern interior of British Columbia; and (2) an investigation of the shell-heaps of the coast of Vancouver island, together with those of the adjacent mainland. Investigations on the Indians of the southern interior of British Columbia were continued by Mr. James Teit. The ethnological work on the Amur river, more particularly among the Gilyak, was carried on by Dr. Berthold Laufer, his investigations in the island of Sakhalin being of special interest. Several months were spent among the various tribes inhabiting the island, and a number of ethnographical objects were collected. Mr. Gerard Fowke has also devoted his attention

to the archæology of the Amur region. An investigation was made along the river for 350 miles above its mouth, and of the coast along the channel of Tartary as far as Okhotsk sea. No evidence was found to indicate a former population different from the present.

Cession of the Carolines to Germany.—By the recent purchase of the Caroline and Marianne archipelagoes by Germany, one of the last remnants of Spain's once imposing colonial empire has passed away from her hands. The groups, as is well known, consist only of small islands, but they are of some strategical importance to Germany by reason of their proximity to the other German possessions in the Western Pacific. For a description and map of the group, as well as special maps of the most important islands, we may refer our readers to the paper by Mr. Christian, published in the February number of the *Journal*. The island of Guam remains in the possession of the United States. It has also been rumoured that negotiations are on foot for the purchase of Fernando Po, in the Gulf of Guinea, by Germany, and of the Canary islands by the Congo State.

Dr. Lauterbach's New Expedition.—It is announced in *Globus* that Dr. Lauterbach, well known as the discoverer of the great Ramu river in German New Guinea, the identity of which with the Ottilien has since been proved by Lieut. Tappenbeck, is about to resume his explorations. He hopes to explore not only the upper Ramu, but the Great Bismarck range which bounds its valley to the south, and has for this object secured the services of two Australian prospectors.

POLAR REGIONS.

The Swedish Expedition to East Greenland.—This expedition, under direction of Dr. Nathorst, in search of Andrée and his companions, left Stockholm on board the *Antarctic* on May 20, and Helsingborg, where further provisions, coal, and equipment were taken on board, on the 25th. It was the intention of Prof. Nathorst to use the sails as much as possible, in order that the campaign through the ice might be begun with a plentiful store of coal. He intends to do some hydrographical work north-east of Shetland and in the "Norwegian Deep," and it is on this account that the expedition has left Sweden so early. The *Antarctic* is under command of Captain N. Forsblad, of the Swedish merchant service, who was first mate during the expedition to Spitsbergen and King Charles Land last year, while the then second mate, Captain H. J. Haslum, a Norwegian, who makes his twenty-fifth journey to the north polar region, has advanced to first mate. The second mate, Captain J. Menander, as well as the chief engineer, Mr. T. Peterson, and several of the crew, were also members of the expedition last year. The scientific staff is not quite so numerous as last year, partly in consequence of some cabins having been left empty for Andrée and his companions, if found, partly because the stay on land will be relatively short. Besides Prof. Nathorst, who undertakes the geological work, the scientific members are the following: Mr. Elis Nilson, zoologist (vertebrates), forest-officer, who made the journey to Baffin bay on the steamer *Eclipse* of Dundee in 1894, in search of the unfortunate Björling and Kallstenius; Mr. P. Dusén, C.E., explorer of Cameroon and Tierra del Fuego, botanist and cartographer; Dr. T. Arwidsson, zoologist (vertebrates); and Dr. J. Hammar, surgeon. There is little hope that the coast of Greenland can be reached before the latter part of July, and the passage through the ice will therefore not be begun before the end of June or beginning of July. Prof. Nathorst thinks that he will make this passage between 74° and 76°, and that he will reach the coast at Shannon island. As soon as he has reached the coast, expeditions will be made to north and south. If Andrée has reached the coast, he will probably have raised some signal with information where he has gone. As to the work at the coast, this will

depend on circumstances, and it is unnecessary to give further particulars here. Prof. Nathorst hopes to be back in the latter part of September, but if the vessel should be caught in the ice, he has provisions for a year, so that he is prepared for wintering, although he hopes that it will not be necessary.

Expedition of the Duke of the Abruzzi.—The Duke of the Abruzzi, whose plans for an attempt to reach the north pole have already been described in the *Journal*, sailed from Christiania on June 12, in the *Stella Polare*, for the arctic regions.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Pole of the Land-hemisphere.—A further contribution to this subject is made in the third number of the *Geographische Zeitschrift* by Prof. Penck, who, in discussing the results arrived at by H. Beythien (cf. *Journal*, vol. xiii. p. 543), shows that considerable modifications are introduced if we take account of the ellipsoidal form of the Earth. Krümmel's method is based on the idea of a perfect sphere, and he thus supposed that if we have a hemisphere with a pole in lat. 47° 15′ N., the angle made by the corresponding equator with the plane of the Earth's equator would be 90°—47° 15′, or 42° 45′. With an ellipsoid of rotation, however, this is not the case. The radius of a point in 47° 15′ N., makes with the Earth's equator an angle equal to the geocentric latitude, which in 47° is $\frac{1}{3}$° less than the geographic latitude. The angle between the respective equatorial planes is therefore $\frac{1}{3}$° greater than was supposed. Conversely, if we find this angle to be 42° 45′, the pole of the land-hemisphere will not be in 47° 15′, but in 47° 27′. Taking account of this fact, it is found (1) that the pole corresponding with Beythien's equator must be moved more than 12 miles to the north; and (2) that the equator of the land-hemisphere must be represented on Beythien's map, not by a straight line, but by one slightly curved, diverging northwards from his line in accord with the differences, in the respective latitudes, between geographic and geocentric latitude. The total loss of land-area in Asia will thus amount to 43,000 square kilometres, and the nett loss for the whole hemisphere to 3000 square kilometres. Making similar corrections for the lines corresponding with Beythien's other poles, we find that his No. 5 (in 47° N. and $1\frac{1}{3}$° W.) is the most favourably placed, and, with the proper correction for the difference between geographic and geocentric latitude, this lies in $47\frac{1}{3}$° N., and just east of Nantes. Another result is that the differences in the merit of the several poles are lessened, not exceeding the extent of probable error; while a second district, in the department Ariège, is found to be particularly favourable for the choice of a pole, possibly more so than that around Nantes. The choice of one or other locality practically depends in the inclusion or otherwise of Japan within the land-hemisphere; and, whatever the final verdict, the fact is clearly brought out that the land-masses are not grouped round a single centre.

GENERAL.

Honour to Henry M. Stanley.—We record with pleasure the honour lately conferred by Her Majesty on Henry M. Stanley, whose selection for the distinction of Knight Grand Cross of the Bath is a well-deserved recognition of his great services to the cause of African geography.

OBITUARY.

Mr. C. H. Coote.

THE death of Mr. Coote, of the Map Department in the British Museum, is a great loss to geographical learning in this country. Few men, either in England or on the Continent, have had a more thorough acquaintance with sixteenth, seventeenth, and eighteenth century cartography. Mr. Coote's knowledge of mediæval maps was also very extensive. He had a keen interest in the difficult and controverted points which naturally arise in the study of historical cartography, as in other branches of science, and he followed an intricate argument with close attention and a rapid perception of its weaker and stronger points. Thus any one acquainted with the subject-matter would have been impressed by his remarks on the chief writings in the Cabot controversy, and by his criticism of the cartographical oversights and misstatements which have injured some of the most careful and elaborate studies in this field.

It is much to be regretted that Mr. Coote did not complete any work which would have made him as great a public authority (in some branch or period of historical geography) as he was a private referee for other students; but this was not his fault. In his position, bound as he was to be at the service of every visitor to the Map-room, it was not possible for him to do much more than the work of his department. And this was doubtless satisfactory to the authorities of the Museum; but the consequence, in the present case, has been that various essays, papers, booklets, and reviews, which might have been co-ordinated into some standard treatise, to be consulted and valued by generations of geographical workers, have remained in the stage of valuable fragments; and so we have nothing from R. H. Major's old colleague and true successor which can be put alongside of the former's 'Life of Henry the Navigator.' An exhaustive and (for the English reader) final study of early Dutch cartography Mr. Coote's friends might have expected to see from his pen, if he had ever been able to devote himself to research work. From such a flight, suspicious and repellant to the official mind, the National Library was careful to restrain him; and, in consequence, one must be content with saying that Mr. Coote's writings are very inadequate representations of his wide learning, even if they give a fair picture of his painstaking and minute scholarship. We must be thankful for his editions of the 'Harleian' and other Dieppese mappemondes of 1536–50 ('Bibliotheca Lindesiana;' 'Collections and Notes,' No. IV.; 'Facsimiles of Three Mappemondes, 1898'); of various important examples of seventeenth-century Dutch cartography in the series of 'Remarkable Maps' (Parts I., II.), published by Frederick Müller, of Amsterdam; of the much disputed 'Voyage of Vespucci to India' in 1505–6 (B. F. Stevens, 1894); of Shakespeare's 'New Map, with the Augmentation of the Indies,' referred to in *Twelfth Night* (Hakluyt Soc., vol. lxxii., 1886). We must also not forget his co-operation with Mr. Delmar Morgan in a joint edition of 'Early Voyages and Travels in Russia and Persia,' by Anthony Jenkinson and others (Hakluyt Soc., 1886); or the great assistance he rendered to the late Mr. Major in so many of his books. His life of Sebastian Cabot in the 'Dictionary of National Biography' is able and scholarly; and though it may be regretted that Mr. Coote sanctioned the 'Bristol' theory of Sebastian's birthplace, it is far more unfortunate that the writer of that article never had the opportunity to deal with the whole Cabot controversy in a set treatise, comparable to those of M. Harrisse. The present writer well

remembers how keen and how minute an interest he took in that fascinating subject; few, if any, were better acquainted with it on the cartographical side; and his suggestions were of great service in the preparation of the volume on John and Sebastian Cabot for the series of 'Builders of Great Britain.' Yet how small are these items in comparison of what might have been said if Mr. Coote had enjoyed the comparative freedom of some other men for original work.

Obituary of the Year.

The following is a list of the Fellows who have died during the year 1898–99 (May 30)—

Sir T. Dyke Acland; W. J. Anderson; David Aitchison; G. H. Andrews; General R. D. Ardagh; K. E. Brodribb; William Brown; Major Bridgford; Rev. T. E. Brown; Captain J. F. Browne; Sir Henry Barkly; E. W. Berryman; R. H. Blades; Sir G. Baden Powell; John Barrow; Charles Bonney; Baron John Bentinck; Sir George Bowen; W. Bickford Smith; Major D'Arcy Baker; D. J. Caddy; Rev. Tupper Carey; C. J. Cassiani; Don Louis Carranza; Don Francisco Coello; John E. Chanler; Colonel Alexander Cook; John M. Cook; W. M. Crocker; W. H. Davies; Major G. de Winton; T. H. Davis; Robert E. Davies; Captain F. G. Dundas; General Sir W. K. Elles; C. Washington Eves; John Forster; Sir W. A. Fraser; Colonel J. B. Findlay; Sir John Fowler; Major-Gen. G. McB. Farquharson; Sir Clare Ford; J. C. W. P. Graham; Sir George Grey; General W. H. Goodenough; Sir Douglas Galton; Dr. C. Herz; Charles Harrison; V. W. C. Hamlyn; Charles Hoare; Hon. H. G. L. Howard; W. H. Halliday; W. H. Heaton; Wm. Alfred Harrison; B. A. Hankey; Chevalier F. Jeppe; Wm. Morris James; F. P. Keysell; D. M. Kisch; David Kay; Captain Kirkpatrick; Commander Keane; Prof. Kiepert; H. N. Lay; Rev. D. Grenville Lewis; G. R. le Pays; Sir C. C. Lees; Sir E. Lugard; Earl of Lathom; A. F. Low; J. C. Leaver; Don Ramon Lista; Thomas Martin; Colonel E. Molyneux; H. B. Marshall; Colonel W. C. F. Molyneux; Alfred Morrison; Arthur Mills; Captain J. P. Mayo; Admiral Thomas Miller; Captain Philip Montagu; Wm. Lord Newton; Duke of Northumberland; H. M. Ormerod; Admiral Pike; Colonel W. Pinney; Sir Henry Peek; Chevalier Max. Proskowetz; Hon. R. Pharazyn; J. H. Paul; John Pickering; Sir Lambert Playfair; W. H. Rinder; Major John Ramsay; E. Rawson-Walker; C. D. Radcliffe; Lieut. W. J. L. Roe; Baron de Reuter; Henry Rose; Duke of St. Albans; J. L. Clifford Smith; Osbert Salvin; Henry Smiles; Captain J. R. B. Serjeant; Don S. Salas; G. E. T. Smithson; George Sutherland; Robert Tait; James Wales; Colonel R. G. Woodthorpe; Right Hon. S. Walpole; Lieut.-Colonel H. L. Wells; O. C. Waterfield; J. S. Webb; J. H. Watson; George Wedd; Mr. Justin Winsor; W. F. Webb.

CORRESPONDENCE.

The Canadian Rockies.

Since my paper on "Exploration in the Canadian Rocky Mountains" appeared in the April number of the *Journal*, my attention has been drawn, by Dr. George M. Dawson, head of the Geological Survey of Canada, to a passage in my paper that certainly needs correction. The statement is as follows: "Most of our knowledge, therefore, at the present time, of that part of the mountains which lies 100 miles to

the north or to the south of the railway at Laggan is either knowledge gained in the early part of the century by traders in the employ of the fur-trading companies, or from Palliser's 'Journals,' or Wilcox's book on Mount Assiniboine and the surrounding country."

Dr. Dawson has kindly sent me a report of the Geological Survey of Canada for 1886, in it can be found, not only descriptions of a great deal of the mountain country south of Laggan, but also a large reconnaissance map of the country, geologically coloured by Dr. Dawson, as far south as the South Kootanie pass.

This report of Dr. Dawson's contains a most interesting description of that portion of the Rocky mountains extending from the international boundary northward to the headwaters of the Red Deer river; moreover, it includes a history of all previous exploration, and no less than nine passes across the great divide were explored. In 1886 a detailed examination of the Bow river pass and vicinity was also made by Mr. R. G. McConnell. Dr. Dawson has also sent me the preliminary report for 1898, in which Mr. J. McEvoy, of the Canadian Geological Survey, during his exploration last summer in the mountains near the Yellow Head pass, discovered an exceptionally grand mountain (Robson peak), near the headwaters of the Fraser river. By trigonometric measurements he finds this peak to be 13,500 feet high. It is therefore the highest known peak of the Canadian Rocky mountains that has been accurately measured, although I believe that Columbia peak at the headwaters of the Athabasca will prove to be nearer 14,000 feet when its height is properly determined. And this statement is not the result of mere guessing, for we climbed peaks 11,900, 11,600, 11,400 feet (height measured by mercurial barometer) within a few miles of Mount Columbia, and were, therefore, well able to judge its height within a few hundred feet. Moreover, those peaks that we discovered last autumn, Mounts Bryce, Columbia, and Alberta, are grouped round glaciers that feed three of the largest rivers in Canada, and therefore probably constitute the culminating point of the Canadian Rocky mountain system.

J. Norman Collie.

Rhodesian Art.

Dr. Henry Schlichter's most interesting paper on "Travels and Researches in Rhodesia," which appeared in the April *Journal*, has thrown light upon some of my South-East African curios. While packing for my homeward voyage last year, a friend handed to me a carved bamboo snuff-box about 2½ feet long. "Here you are," he said; "take that home and show your friends what the native of this country is able to do in his raw state." He is a merchant who believes in the native. The snuff-box had to me simply the ordinary interest, until I unpacked my curios at a missionary exhibition after reading Dr. Schlichter's paper; then the mystery of the carving was solved, and at once it flashed upon me that the native who carved the bamboo snuff-box had been influenced by the ancient Semitic people who three thousand years ago colonized South-East Africa. Evidently he had copied the wall decorations of the Mombo ruins, and the ornaments on the terrace of the ruins. Beautifully and correctly carved are the chess patterns, the Zimbabye pattern, double herring-bone, and pointed cone.

Wm. Copeland.

Buttermere Vicarage, June 6, 1899.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1898-99.

Eleventh Ordinary Meeting, May 29, 1899.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Alfred Adam; Henry Coates; Robert Furrest; William Coutts Fyfe; Charles Phillips Sanders; Henry Cathcart A. Young.*

The Paper read was :—

"Explorations in Patagonia and the Eastern Andes." By Dr. Francisco Moreno.

Anniversary Meeting, June 5, 1899.—Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

THE Secretary read the Minutes of the last Anniversary Meeting.

ELECTIONS.—*W. Freke Evans; William Foster; A. J. Grant; Richard N. Hall; Captain Bernard Ramsden James; Lucien Joseph Jerome; Frank Mills; William Duerdin Perrott; P. Lee Phillips; Robert de Rustafjaell; H. R. Wallis.*

The Presentation of the awards for the year then took place.

The PRESIDENT, addressing the French military Attaché, said: In the name of the Royal Geographical Society we have to thank you for your kindness in coming here on this occasion, to receive the medals of your compatriots, who are unavoidably absent. Captain Binger has explored the bend of the Niger in the extensive region hitherto unknown, or only partially known. He has devoted to that work his rare gifts of intrepidity, resolution, perseverance, and his great scientific attainments, and the result has been a work which will be the authority on the subject of the region of the bend of the Niger hereafter.

M. Foureau has for the last twelve years been leading expeditions into the wild deserts of the Sahara; he also has devoted great energy to this work, which is one of extraordinary difficulty and hardship, and his scientific results have been most valuable, he having astronomically fixed a great number of points in a previously unknown region.

Your two illustrious compatriots have thus, by their great geographical achievements, won for themselves a place in the forefront of the glorious roll of African travellers. I cannot help saying on this occasion that, whatever may have been the rivalries between our two countries, the geographers of Britain and France have never had any feeling of the kind since the days of Bourgainville; they have only felt generous emulation in furthering the common work of geographical science. I think I should mention to you that the two medals are given by Her Majesty, and that the Council of this Society is entrusted with the very responsible duty of assigning them; and I would add, also, that the medals are exactly of the same value—I don't mean only intrinsically, but as regards their honorary value. I now have the great pleasure of placing in your hands, for transmission to the recipients, the Founders' Gold Medal for Captain Binger, and the Patron's Gold Medal for M. Foureau.

Colonel Count DU PONTAVICE DE HEUSSEY, French military Attaché: In the name of my fellow-countrymen, M. Binger and M. Foureau, I tender grateful thanks for the great honour bestowed on them this day by the Royal Geographical Society, and for the gold medals which I have received for them. I thank the Royal Geographical Society, not in their name only, but in the name of my

Government and of my country, for this splendid recognition of the labours of my two compatriots.

I believe this is the first occasion on which two gold medals have been conferred on Frenchmen at the same time, and, indeed, I understand that only in two previous instances—that of Francis Garnier and that of Mr. Élisée Reclus, the celebrated geographer—has such an honour been conferred at all. This fact invests the present gathering with a special pride and interest for all Frenchmen. Captain Binger, who now holds a high official position in our colonial administration, had ardently desired to be present here himself, and to receive the medal conferred upon him from the hands of your distinguished Chairman; but his official duties prevent him from leaving Paris, and he has begged me to express his deep regret and also the pride and satisfaction he feels at having been selected to receive this honour—a pride and satisfaction which are increased by the conviction that in doing him honour you desire to honour the work done by French explorers generally towards the civilization of the continent of Africa.

These feelings, believe me, are shared in every particular by Monsieur Foureau. He is far away, still labouring hard, and no doubt preparing fresh scientific results to be added to those already attained, and which will, I trust, give further proof that the men you have chosen to honour are worthy of your choice.

Before I sit down I should like, as a Frenchman and a soldier, to express my heartfelt thanks to all this assembly for the warm and friendly reception given to the successes won by my distinguished fellow-countrymen. I shall not fail to let them know all the details of this meeting, and the memory of it will be a precious one to them. Neither will it be forgotten in the country they love and serve.

This honour bestowed on two sons of France, as a reward for labour which has called, not only for scientific knowledge, but frequently for great personal heroism, will be all the more valued because it is given in a year full of special feeling to the loyal subjects of Queen Victoria, and, let me add, such ceremonies, such recognition of noble endeavour, as these at which we assist this afternoon must surely draw our two countries, which both of them know how to produce and how to value heroes, into closer and more intimate bounds of friendship and mutual appreciation.

The PRESIDENT: The Murchison Grant has been awarded to Mr. Albert Armitage, of the Jackson-Harmsworth expedition. In giving the reasons for this award, I cannot do better than quote the words of Mr. Jackson himself. He says, "To the energy and industry of Mr. Armitage is due the carefully recorded meteorological, astronomical, and magnetic observations, extending over three years. To Mr. Armstrong's loyal aid I wish to offer my testimony. We have been through rough times in many dangers and hardships together, and I know the good material of which he is made." It is particularly agreeable to me to have to present this award, because of the deep interest I have always taken in the *Worcester*, where Mr. Armitage was educated. I am glad to say we have here present the late captain of the *Worcester*, Captain Henderson Smith, and the present captain of the *Worcester*, Captain Wilson Barker, and I believe one or two former cadets of the *Worcester*, and after his own family I am sure none will rejoice more at this recognition than the cadets of the *Worcester*. Many of them will wish to emulate the deeds of their old schoolfellow.

Mr. Carnegie, the Gill Memorial has been awarded to you for your very remarkable journey in Western Australia, both from south to north, and again from north to south; for the admirable way in which you have conducted your expedition; and for the route survey, combined with astronomical observations, by which you laid down your routes. On that occasion it is interesting to remark that you

actually twice crossed the route of three of our Gold Medallists, Forrest, Warburton, and Giles. I now have great pleasure in placing in your hands the gold watch which you have selected for your award.

Captain Sykes has received the Back Grant for his important journeys in Persia, during which he corrected many errors in the former maps of Persia, and acquired useful geographical information. It has been his great merit to study the ancient history of the country, following in the footsteps of Sir Henry Yule, and he has discussed interesting points connected with the geography of Marco Polo and the earlier Persian geographers.

Hon. DAVID CARNEGIE: I don't know that this meeting calls for any long speeches. It only remains for me to apologize for the slight service I have been able to do. I am sorry I have not been able to bring back more results, but that is more the fault of the country than of me. I assure you that when I was in the middle of Australia, the last thing I thought of was that I should find myself standing here with a high collar on to return thanks, and I feel very much gratified to find my services acknowledged, and my present ambition is to find myself standing here again at some future occasion.

The PRESIDENT then delivered his Annual Address (see p. 1), after which he said: We have been requested by our sister Society in New York to offer the facilities of our anniversary meeting to His Excellency the American Ambassador, for the purpose of presenting the medal of the Geographical Society of New York to our respected colleague Sir John Murray. It is with very great pleasure that we have acceded to this request, for our intercourse with the American Geographical Society has always been most friendly. I am proud to say that its venerable President has been my friend for upwards of a quarter of a century. I will now ask His Excellency to present the medal.

His Excellency the American Ambassador, Mr. CHOATE: I ought to apologize for having come here late to perform this pleasing duty, as it should have been done at the presentation of the other medals by your own Society, but when I tell you that I had a previous engagement to be present at the gathering of the Master and Brethren of the Trinity House—at which the Prince of Wales was present as the Elder Brother of the House—I am sure you will excuse my temporary absence. His Royal Highness was graciously pleased, when I told him of the pleasant duty I had to do here this afternoon, to wish me God-speed and bid me take French leave.

I appear here as the representative of the American Geographical Society of New York, and with the concurrence, I may say, of the Secretary of State of the United States, who expressed, on behalf of the Government of that country, full sympathy with the objects which the New York Society had in view. I appear here as the bearer of its Gold Medal to present to one of your most distinguished scientific men. The American Society is one of those associations for similar purposes as your own, formed many years ago in emulation of the noble example which this Society has set to the world. Undoubtedly it has achieved great successes on its own part; it has been the patron of many illustrious expeditions which have extended the world's geographical knowledge, and it has acted no small part in advancing the science of geography, to which you are all so ardently devoted; and as the spirit of science knows no geographical boundaries, it is in entire sympathy with efforts in the same direction the world around, and so, in assigning its really beautiful Gold Medal, the American Society has not confined itself to the citizens of its own country, but has looked the world over for the worthiest to be its recipient. It is not for me to state in this presence what Sir John Murray has done to entitle him to such recognition on the part of our distant Society; you

know far better than I do the great works which he has accomplished. I think it is all summed up on the front of this medal, and in lieu of a longer speech you will perhaps allow me to state what appears on its face—

"THE CULLUM GEOGRAPHICAL MEDAL, AWARDED TO SIR JOHN MURRAY, K.C.B., NATURALIST, DEEP-SEA EXPLORER, OCEANOGRAPHER, EDITOR 'CHALLENGER REPORTS.' 1899."

And on the reverse—

"THE AMERICAN GEOGRAPHICAL SOCIETY, NEW YORK,"

with a relief of the ideal explorer, an ideal scientist, standing in the bow of his boat as it approaches what seems to me to be the antarctic continent, shading his eyes from the glare of the polar sun, as he looks forward in search of his hoped-for discovery. Now, that tells the whole story. If I were to have prepared an annual address, I could not have stated it more succinctly or more fully. It gives me the greatest pleasure, on the part of the American Society and the people of America, to be here to-day to make this presentation. I am sure that science, together with art and literature, form enduring links which will perpetuate the friendship that now exists between the two countries. For if the brains of two nations are always working together, how can their hearts be far apart? And so, Mr. President, by your leave, I deliver and present this medal to Sir John Murray, wishing him, on the part of the Society who gives it and the country I represent, long life and still more distinction than he has already achieved. He is equally at home on the floor of the ocean as upon dry land, and it is to zeal and enthusiasm, and perseverance, such as he has always exhibited in the cause of science, that its future victories will be due, and the arctic and antarctic regions alike will give up their secrets, and science will have mastered the whole world.

Sir JOHN MURRAY: It is my first duty to thank the President, the Council, and the Fellows of the American Geographical Society for the high honour they have conferred upon me in awarding me this Cullum Gold Medal of the Society. In the next place, I think it is my duty to thank his Excellency the Ambassador of the United States for the flattering terms in which he has referred to me personally, and for the grace with which he has spoken of scientific men generally. I am informed, and I believe correctly, that this medal has twice been conferred before this, once on a distinguished countryman of your own, Lieut. Peary, and upon Dr. Nansen. Both these gentlemen are friends of my own, and they have made noble journeys in the cause of science and of geographical work under conditions of great hardship, and they have been successful. I can lay claim to having done nothing that can in any way be compared with their endurance and their resource under great troubles and difficulties; but I feel there is a certain satisfaction—I feel this myself, and I believe it is shared by other scientific men, that the American Geographical Society also appreciates long-continued and combined effort in the cause of the acquisition of knowledge concerning the surface of the planet on which we live; for I regard this award, not so much as for any personal merit that belongs to myself, but as a recognition of the valuable work that has been performed by the great expedition with which my name is now so often associated, and therefore the honour is shared by all my colleagues, naval, literary, and scientific. I would mention that among the most distinguished contributors to the great report of the *Challenger*, no less than three of the large volumes have been prepared by your own countrymen—Prof. Alexander Agassis; Prof. Lyman, of Harvard; and Prof. Brooks, of Johns Hopkins University.

One of our poets says—

> "Lands intersected by a narrow firth abhor each other,
> Mountains interposed make enemies of nations, who had else,
> Like kindred drops, been mingled into one."

On some portions of the Earth's surface this may still be true, but many of the civilized nations are fast outgrowing that state of things. To all those who watch the wheels of Nature's mazy plan, and learn the future by the past of man, it must appear evident that humanity is slowly rising to a higher intellectual plane; not only the narrow firth, but the great ocean itself has become a theatre where scientific men meet, where all are willing to help each other and to combine in order to increase natural knowledge; not alone on the ocean, but geologists and other scientific men unite in mountain ranges to study their origin. In these and a hundred other ways there is being woven between the nations gossamer threads of thought and endeavour, which may ultimately prove so strong that not all the engines of modern warfare shall be able to break them. At all events, the feeling of sympathy, especially among all scientific men in all parts of the world, is certainly combining to indicate the lines along which these diplomatic cables may be laid, by which it is hoped to bind nations into something like a peaceful brotherhood. Allow me to ask you to convey to the Council of the American Geographical Society my own expression of high appreciation of this honour, and also the appreciation of all my colleagues, and I hope I may say of all British scientific men. This seems to be the silken thread of sympathy stretched between two great and kindred nations.

The visitors then withdrew, and the President having appointed Captain Henderson Smith and Captain Stiffe scrutineers, the election of the Council for the ensuing year was proceeded with.

The Hon. Secretary, Major Darwin, read the report of the Council for the past year; this will be published in the Year-Book for 1900.

The President then announced that the Council, as proposed, had been elected. The list is as follows, the names of new members, or those who change office, being printed in italics:—

President:—Sir Clements Markham, K.C.B., F.R.S., F.S.A. *Vice-Presidents:* Hon. G. C. Brodrick; Right Hon. Sir George D. Taubman Goldie, K.C.M.G.; *Colonel Sir Thomas Hungerford Holdich*, R.E., K.C.I.E., C.B.; Admiral Sir F. Leopold McClintock, K.C.B., D.C.L., F.R.S.; Admiral Sir W. J. L. Wharton, K.C.B., F.R.S.; General Sir Chas. W. Wilson, R.E., K.C.B., K.C.M.G. *Treasurer:* Edward L. Somers Cocks. *Trustees:* Right Hon. Sir John Lubbock, Bart., F.R.S., M.P.; Sir Cuthbert E. Peek, Bart., F.R.A.S., F.S.A. *Hon. Secretaries:* Major Leonard Darwin, R.E.; James F. Hughes. *Foreign Secretary:* Sir John Kirk, K.C.B., G.C.M.G., F.R.S. *Councillors: Sir H. E. G. Bulwer*, G.C.M.G.; W. T. Blanford, LL.D., F.R.S.; Colonel George Earl Church; Clinton T. Dent; *Major-General Sir Francis W. de Winton*, R.A., G.C.M.G., C.B.; Colonel Sir W. Everett, K.C.M.G.; *Major S. C. N. Grant*, R.E.; *Admiral Sir R. Vesey Hamilton*, G.C.B.; Admiral Sir Anthony H. Hoskins, G.C.B.; *Colonel Augustus le Messurier*, R.E., C.I.E.; Right Hon. Lord Loch, G.C.B., G.C.M.G.; George S. Mackenzie, C.B.; General Sir H. W. Norman, G.C.B., G.C.M.G.; *Duke of Northumberland*, K.G.; Sir George S. Robertson, K.C.S.I.; *Howard Saunders*, F.Z.S.; Frederick Courtney Selous; Herbert Warington Smyth; Lord Stanmore, G.C.M.G.; Colonel Sir Henry R. Thuillier, R.E., K.C.I.E.; Colonel Charles Moore Watson, R.E., C.M.G.

THE ANNIVERSARY DINNER.

In the evening the anniversary dinner took place in the Whitehall Rooms. The President, Sir Clements R. Markham, K.C.B., occupied the chair. There were 260 present, including the following distinguished guests: the American Ambassador, the Belgian Minister, the Argentine Minister, the Chilian Minister, the Bolivian Minister, the Earl of Camperdown, the Earl of Lichfield, Colonel Count Du Pontavice de Heussey, Lord Justice Vaughan Williams, Field-Marshal Sir Donald Stewart, General Sir George White, Admiral S. C. Holland, Lord Bangor, Admiral Sir R. Tracey, Captain Egerton, R.N., C.B., Colonel L. W. Longstaff, Sir H. E. L. Bulwer, Sir Charles Hall, Sir J. Savory, M. A. Bertrand, Sir G. Fitzgerald, Sir W. B. Richmond, Dr. F. P. Moreno, Mr. G. E. Buckle, Sir John Durstan, Mr. W. E. Smith (Chief Constructor), Abbé Rénard, M. Arctowski.

The PRESIDENT proposed the toasts of "The Queen," "The Prince of Wales and Duke of York, Vice-Patron and Hon. President," and "The Navy and Army and Auxiliary Forces." He coupled the latter with the names of Admiral Sir R. E. Tracy, Field-Marshal Sir Donald Stewart, and Colonel L. W. Longstaff. In asking Colonel Longstaff to respond for the Auxiliary Forces, the President said that he would ever be remembered in that Society and by all geographers for the munificent gift by which he altered their struggling attempt to organize an antarctic expedition into a national undertaking.

The PRESIDENT, in proposing "Our Medallists," said that it had been the duty of the Council this year to award the two medals to two Frenchmen—Captain Binger and M. Foureau. As geographers the explorers of the two nations had only known friendly emulation. He felt that Field-Marshal Sir Donald Stewart hit the right nail on the head when he mentioned the name of Major Marchand. We felt the greatest admiration for the very remarkable journey that Marchand had made. It had scarcely, if ever, been equalled, and he would, in the name of that Society, request his friend the Count du Pontavice to convey to Major Marchand their warm, their hearty congratulations and expressions of admiration. In the unavoidable absence of Captain Binger and of M. Foureau, he coupled the name of Count du Pontavice de Heussey with the toast.

Count DU PONTAVICE DE HEUSSEY said in reply: Let me thank you, in the first place, for the great honour you have done me in asking me to respond to the toast we have just heard so eloquently proposed, and let me express my gratitude for the enthusiastic manner in which the names of your medallists MM. Binger and Foureau have been received. I must confess that I feel a certain timidity in addressing you to-night, for I know and feel that you would have been glad to see one at least of the gentlemen you have so greatly honoured rise in his place at this table to make his own acknowledgment of the distinction they both so greatly value. But I will do my duty, a very pleasant duty, to the best of my ability, and must ask your indulgence if I fail to express my countrymen's gratitude as it should be expressed.

Captain Binger has charged me to tell you how deeply he regrets that the duties of his office utterly forbids his travelling to London, and to add that his immense pride and satisfaction at the honour you have done him are materially increased by his conviction that in his person, and that of M. Foureau, you desire to recognize the services done by the whole body of French explorers to the cause of civilization in the continent of Africa. You may be sure, gentlemen, that M. Foureau—who has spent so many years of patient labour, not in exploration only, but in accumulating valuable geodetic observations in the regions of the Great Sahara—shares Captain Binger's feeling on this point. In his case, doubtless,

present words will be replaced by future maps, and his thanks will ultimately, when his long journey comes to an end, take the shape of further proof that he is a worthy recipient of your Patron's Medal.

I think I may venture to offer my own congratulations, and those of the two fellow-countrymen I am so proud to represent to-night, to the gentlemen who have been honoured in their company by your Society. All of these gentlemen are worthy labourers in the great field of research, and richly deserve the distinction bestowed upon them. And I would add a special word of felicitation to the distinguished Englishman who has this day received from the hands of the American Ambassador the medal awarded him by the American Geographical Society. I am convinced Sir John Murray values his well-merited honour a thousandfold, coming as it does through the hands of his Excellency the Ambassador of the United States, and for my part, I feel a special pride and satisfaction in being present on this auspicious occasion, for I feel no doubt that his Excellency remembers that, though we Frenchmen are not so closely bound to America by ties of common blood as are the Englishmen I see round this hospitable board, yet certain fair states of the union were once French provinces, and the descendants of those old French settlers are now the loyal, the contented, the devoted citizens of the great American Republic which he so worthily represents.

Another name has fallen from the lips of your distinguished President, and has been coupled by him with those of heroes whose efforts to solve the riddles hidden in the depths of unknown countries have already made them famous. Commandant Marchand will treasure as a special honour, among the many showered on him, the greeting just sent him in the name of science. I believe I may assert that he brings back from his long and weary journey certain scientific facts and discoveries which will attract the curious and the wise, and go some way towards clearing up some of the problems left unsolved by that line of illustrious predecessors in African exploration among whom we number Barth, Livingstone, Baker, Speke, Stanley, Cameron, Sir George Goldie, and many others less known, perhaps, but not less brave and untiring.

The mention of the brave French soldier's name will, I feel sure, have given pleasure to the brave English soldiers now sitting round your table, and specially those who were in the memorable Sudan campaign—to Colonel Macdonald, who has just come back from the very country through which Marchand travelled; and Lieut. Vandeleur, who clasped his hand under the African sky, and, I doubt not, feels for him that friendly appreciation and admiration which bravery and patience rouse in the heart of every brave man, whether friend or foe.

Your President has drawn an eloquent picture of the efforts made by Englishmen, at the risk of their own lives, to succour French savants and explorers lost in distant and perilous undertakings in far countries, and he has not failed to tell us, too, how Frenchmen have gallantly striven to carry help to English expeditions in like dangerous cases.

As he spoke, a figure rose up before me, the figure, gentle, kind, though commanding, of a woman—a face that is graven on the hearts of millions of faithful and loyal subjects. And I remembered (let us all remember it always) that this great Queen of yours loves France, her old friend and ally; that under her rule Frenchmen and Englishmen have fought and died side by side in Europe as well as in more distant countries. I felt, when once more your President's story of the self-sacrifice of Englishmen for Frenchmen, and French for Englishmen, made your hearts glow and your eyes shine, that the two nations, whatever newspapers may say, are born to understand each other. Let each one of us do our part, so that no foolish quarrel of petty jealousy shall disturb our friendship; let us take example

by the lives of noble endeavour to which this great Society does honour this night. Let us spend our courage, our strength, our best endeavour in a united effort to widen the mighty circle of civilization, to build up the walls of science, to wage undying war against ignorance and barbarism.

Major DARWIN proposed "The Sister Societies," which was responded to by Mr. T. G. ROOPER. Sir GEORGE GOLDIE gave the toast of "The Guests," which was responded to by the American Ambassador; and in conclusion Sir JOHN MURRAY proposed the toast of "The President."

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alpine Hints. **Ball.**

Hints and Notes practical and Scientific for Travellers in the Alps, being a Revision of the General Introduction to the 'Alpine Guide.' By the late John Ball, F.R.S., &c. A New Edition prepared on behalf of the Alpine Club by W. A. B. Coolidge. London: Longmans & Co., 1899. Size 7½ × 5, pp. clxiv. *Price 3s. net. Two copies, one presented by the Publishers, the other by the Alpine Club.*

Many of the articles have been altered, and some practically re-written, a few new articles are added, and one old one omitted, so that this edition is practically a new work. The book is divided into three parts—Practical hints to travellers in the Alps; Scientific notes on geology, natural history, and photography; and Appendices, consisting of an Alpine Bibliography and a Glossary of Alpine terms.

Alps. *B.S. Neuchateloise G.* 11 (1899): 5–26. **Schardt.**

Les Préalpes Romandes (Zone du Stockhorn-Chablais)—Un problème de géologie alpine. Par Hans Schardt. *With profiles.*

Alps. **Tyndall.**

Hours of Exercise in the Alps. By John Tyndall, LL.D., F.R.S. New Edition. London: Longmans & Co., 1899. Size 8 × 5½, pp. xii. and 482. *Illustrations. Price 6s. 6d. net. Presented by the Publishers.*

This edition has been supplied with an index, but, except for some verbal changes indicated by the author does not differ from the previous edition.

Alps—Eastern. *Mem. S.G. Italiana* 8 (1898): 338–445. **Marinelli.**

Studi orografici nelle Alpi orientali del socio prof. Olinto Marinelli. *With Illustrations.*

Austria—Geographical Progress. *M.G. Ges. Wien* **41** (1898): 1–318. ———

Die Pflege der Erdkunde in Oesterreich 1848–1898. Festschrift der k. k. Geographischen Gesellschaft.

On the work done by various organizations in Austria during the last half-century.

Austria—Gmunden Lake. *Petermanns M.* **45** (1899): 41–42. **Richter.**

Stehende Seespiegelschwankungen (Seichen) auf dem Traunsee. Von Prof. Dr. E. Richter.

This subject is referred to in the *Journal* for June, vol. xiii. p. 656.

Austria—Meteorology. ———

Jahrbücher der k. k. Central-Anstalt für Meteorologie und Erdmagnetismus. Jahrgang 1894, Neue Folge xxxi. Band. (Pp. xxvi. and 192); Jahrgang 1897. Neue Folge xxxiv. Band, I. Theil. Wien, 1898. Size 12 × 9½, pp. 144 and 40.

Austria-Hungary—Dalmatia. *Abrégé B.S. Hongroise G.* **26** (1898): 17–42. **Havass.**

Dalmatien in seinen Beziehungen zu Ungarn mit Rücksicht auf Fiume. Von Dr. Rudolf Havass.

Compares the condition of Dalmatia now and twelve years ago, and suggests that the renewal of the ancient Hungarian rights over Dalmatia would tend to the rapid progress of that country.

Bulgaria. *Mem. S. Spéléologie* **3** (No. 15) (1898): 1–46. **Scorpil.**

Sources et Pertes des Eaux en Bulgarie. Par MM. H. et K. Scorpil. *With Maps and Illustrations.*

Central Europe—Earthquakes. **Günther.**

Jahresb. G. Ges. Munchen, 1896 *u.* 1897 (1898): 76–88.

Das bayerisch-böhmische Erdbeben vom Jahre 1329. Von Prof. Dr. S. Günther.

Denmark. ———

Observations météorologiques-nautiques, 1898, publiées par l'Institut Météorologique de Danemark. Kjøbenhavn, 1899. Size 12½ × 9½. *Maps.*

Europe—Historical. *T. Liverpool G.S.* (1898): 44–63. **Nevins.**

Geographical Picture of Mediæval Europe during the Thirteenth Century. By J. Birkbeck Nevins, M.D.

Europe—Military Geography. **Barré.**

La Géographie Militaire et les nouvelles méthodes géographiques. Introduction à l'Étude de l'Europe Centrale. Par O. Barré. Paris: Berger-Levrault & Cie, 1899. Size 10 × 6½, pp. 80. *Maps and Plate. Presented by the Publishers.*

This treats of the geomorphological basis of all geography, but with special regard to military applications.

France—Statistics. ———

Statistique Générale de la France. Tome xxiv. Statistique Annuelle (Année 1894). Paris, 1897. Size 11 × 7½, pp. x. and 250. *Presented by the French Minister of Commerce, Industry, etc.*

Germany. *P.I. Civil Engineers* **135** (1899): 224–257. **Franzius and Thierry.**

River Regulation Works, and Harbour and Canal Construction in Germany. By Ludwig Franzius and George Henry de Thierry. *With Plates.*

This paper describes the harbour works of Bremen and Bremerhafen, the regulation of the lower course of the Weser, the ports of Hamburg and Stettin, the North Sea-Baltic canal, the ship-canal between Dortmund and the Ems, the Elbe-Trave canal, and the improvement works on the Oder and Vistula.

Germany. *Globus* **75** (1899): 265–268. **Halbfass.**

Das Steinhuder Meer. Von Dr. Halbfass.

A small lake in North Germany, in 52° 30′ N. and 27° E., about 5 miles long, and only 10 feet in maximum depth.

Germany. *Globus* **75** (1899): 194–195. **Halbfass.**

Der Seeburger See bei Göttingen. Von Dr. Halbfass.

Germany. **Niessen.**

Brown Coal Mining in the Rhineland. Foreign Office, Miscellaneous, No. 497. 1899. Size 10 × 6½, pp. 10. *Price* 1*d.*

Germany. *J.S. Arts* **47** (1899): 443–459. **Rozenraad.**

The Commercial Development of Germany. By C. Rozenraad.

Germany—Geology.

Naturw. Wochenschrift **13** (1898): 565, 613; **14** (1899): 33, 57.

Die allgemeine Versammlung der Deutschen geologischen Gesellschaft zu Berlin vom 26–28. September, 1898. Excursionen. *Map and Diagrams.*

Notes on geological excursions in North Germany.

Germany—Historical. *Petermanns M.* **45** (1899): 57–66. **Gradmann.**

Der obergermanisch-rätische Limes und das fränkische Nadelholzgebiet. Von Dr. Robert Gradmann. *With Map.*

On the Roman boundary against the free German tribes from the Main at Miltenberg southward and eastward to the Danube above Regensburg. To the east or north of this line a very large proportion of the place-names refer to pine-trees, while scarcely any names derived from coniferous woods occur to the west or south.

Germany—Oder. *G.Z.* **5** (1899): 19–47, 84–94. **Penck.**

Der Oderstrom. Von Albrecht Penck.

Germany—Prussia. *Naturw. Wochenschrift* **14** (1899): 172–173.

Ueber die Moore des Königreichs Preussen.

Germany—Prussia. *Globus* **75** (1899): 217–222. **Kellen.**

Die polnischen Niederlassungen im Ruhrkohlenreviere. Von Tony Kellen.

Greece—Patras. **Wood.**

Trade of Patras and District for the Year 1898. Foreign Office, Annual No. 2214. 1899. Size 9½ × 6½, pp. 16. *Price* 1*d.*

Hungary—Budapest. **Thirring.**

Statistisches Jahrbuch der Haupt- und Residenzstadt Budapest. I. Jahrgang, 1894. (Mit Rückblicken auf die Jahre 1874–1893.) II. Jahrgang, 1895 und 1896. Redigiert und bearbeitet von Prof. Dr. Gustav Thirring. Herausgegeben vom Statistischen Bureau der Haupt- und Residenzstadt Budapest. Budapest und Berlin: C. Grill, 1896–1898. Size 10½ × 7½, pp. (i.) xiv. and 340, (ii.) x. and 426. *Presented by Dr. Thirring.*

Hungary—Lake Balaton.

Resultate der wissenschaftlichen Erforschung des Balatonsees. . . . Erster Band. Physische Geographie des Balatonsees und seiner Umgebung. Vierter Theil. Erste Section. Der Klimatologischen Verhältnisse der Umgebung des Balatonsees. Von Dr. Johann Candid Sáringer (pp. 130); Zweite Section. Niederschlagsverhältnisse und Regenkarten (aus den Jahren 1882–1891). Verfasst von Odön v. Bogdánfy. Wien: E. Hölzel, 1898–99. Size 11½ × 8½, pp. 16. *Maps.*

Iceland. *Travel* **3** (1899): 565–570. **Howell.**

Iceland, the Wonderland of Europe. What to see there, and how best to see it. An Interview with Mr. F. W. W. Howell. *With Illustrations.*

Italy. *Riv. G. Italiana* **6** (1899): 32–43. **Battisti.**

Gli studi limnologici italiani nel 1898. Nota bibliografica del Dott. Cesare Battisti.

Italy. *B.S.G. Italiana* **12** (1899): 51–63. **Rosetti.**

Emilia e Romagna, nota del socio ing. Emilio Rosetti.

Italy—Alpine District. *Riv. G. Italiana* **6** (1899): 3–13. **Giannitrapani.**

Col. D. Giannitrapani. La regione alpina. (Descrizione sintetica.)

Italy—Caserta. *B.S.G. Italiana* **12** (1899): 103–108. **Agostini.**

Il lago del Matese (Provincia di Caserta). Nota del socio dott. Giovanni de Agostini. *With Map.*

A small and very shallow lake, without visible outlet, in a valley about 3500 feet above sea-level.

Italy—Rome. **Murray.**

A Handbook of Rome and the Campagna. Sixteenth Edition. With Ninety-four Maps and Plans. London: John Murray, 1899. Size 7 × 5, pp. x., 126 and 496. *Price* 10*s.* *Presented by the Publisher.*

Mediterranean—Cyprus. **Fyler.**

The Development of Cyprus, and Rambles in the Island. By Colonel Fyler. With coloured Illustrations, Maps, and Plans. London: P. Lund, Humphries & Co. [not dated]. Size 8½ × 6, pp. 138. *Presented by the Publishers.*

A sketch of the history of Cyprus, followed by an account of its political and

financial position, its naval and military position as part of the British Empire, and its commercial position. The book concludes with some account of the scenery and tours, and the description of a trip from Troodos to Kyrenia and Famagusta.]

Montenegro. **Horák.**

Ergebnisse einer botanischen Reise nach Montenegro. Von Bohnslav Horák. (Sitzungsberichte der Königl. böhmischen Gesellschaft der Wissenschaften. Mathematisch-naturwissenschaftliche Classe. 1898.) Prag, 1898. Size 10 × 6, pp. 12.

Norway—Anthropology. *Skrifter Vidensk. Christiania* (1898, N. 6): 1-86. **Arbo.**

Fortsatte Bidrag til Nordmændenes Anthropologi. V. Nedenæs Amt. Af C. O. E. Arbo. *With Diagrams and Illustrations.*

Norway—Climate. *Skrifter Vidensk. Christiania* (1898, N. 2): 1-44. **Mohn.**

Klima-Tabeller for Norge. IV. Vind. Af H. Mohn.

Norway—Plants. *Skrifter Vidensk. Christiania* (1898, N. 9): 1-28. **Kaalaas.**

Beiträge zur Lebermoosflora Norwegens. Von B. Kaalaas. *With Illustrations.*

Pyrenees—Lakes. **Delebecque and Ritter.**

Quelques lacs des Pyrénées. Par A. Delebecque et E. Ritter. (Extrait des Archives des Sciences physiques et naturelles. Quatrième période, t. vi.—Novembre 1898.) Size 9 × 6, pp. 4.

A classified list of some of the lakes of the Pyrenees, with particulars as to their position, size, form, and depth.

Russia. *Ann G.* **8** (1899): 127-140. **d'Almeida.**

La colonisation russe dans les gouvernements d'Oufa et d'Orenbourg. Par M. P. Caména d'Almeida.

Russia. **Engelhardt.**

A Russian Province of the North. By Alexander Platonovich Engelhardt, Governor of the Province of Archangel. Translated from the Russian by Henry Cooke. London: A. Constable & Co., 1899. Size 10 × 6½, pp. xx. and 356. *Portrait, Maps, and Illustrations. Price* 18*s. Presented by the Publishers.*

The extreme north of European Russia has so long been linked with this country commercially, that this translation of the description of the province of Archangel by its most progressive and enterprising governor cannot fail to be of great interest. Each section of the vast province is dealt with separately, including the Kola peninsula, the Murman coast, Novaya Zemlya, and the Pechora country. There are statistical appendices, illustrations, and maps. The transliteration of Russian names is not in accordance with the recognized English usage. It is an error to speak (p. 29) of 65° N. as "within the arctic circle."

Russia—Botany. *Mém. A. Imp. Sci. St. Petersbourg* **7** (1898): 1-566. **Korshinsky.**

Tentamen Florae Rossiae orientalis, id est provinciarum Kazan, Wiatka, Perm, Ufa, Orenburg, Samara partis borealis atque Simbirsk. Auctore S. Korshinsky. *With Maps.*

Russia—Finland. *Fortnightly Rev.* **65** (1899): 735-744. **Bain.**

Finland and the Tsar. By R. Nisbet Bain.

On the proposed changes in the political system of Finland.

Russia—Finland. *Nineteenth Century* **45** (1899): 699-715. **Reuter.**

Russia in Finland. By Dr. J. N. Reuter.

Dr. Reuter, a member of the University of Helsingfors, states very clearly the present political position in Finland, and the serious nature of the Tsar's recent action with regard to the constitution of the grand duchy.

Russia—Finland. *Contemporary Rev.* **75** (1899): 652-659. **Westermarck.**

Finland and the Czar. By Professor Edward Westermarck.

Servia. **Macdonald**

Trade of Servia for the years 1897-98. Foreign Office, Annual 2207, 1899. Size 9½ × 6½, pp. 18. *Price* 1½*d.*

Spain. *G.Z.* **5** (1899): 177-189. **Maerker.**

Die geographischen Ursachen von Spaniens Niedergang. Von Prof. Julius Maerker.

On the geographical causes of the decline of Spain.

Spain—Corunna. **Talbot.**

Trade of Corunna and District for the year 1898. Foreign Office, Annual No. 2216, 1899. Size 9½ × 6, pp. 34. *Map. Price* 4*d.*

Contains a railway map, showing the new direct route from Corunna to Madrid.

United Kingdom. *Symons's Monthly Meteorolog. Mag.* **34** (1899): 33–36. ——

Winter Minima on British Mountain Tops.

United Kingdom. *Natural Sci.* **14** (1899): 273–289. **Buckman.**

The Development of Rivers; and particularly the Genesis of the Severn. By S. S. Buckman. *With Sketch-maps.*

See note in *Journal.*

United Kingdom. *J.S. Arts* **47** (1899): 475–496. **Hunter.**

London's Water Supply. By Walter Hunter.

United Kingdom—Coal. *J.S. Arts* **47** (1899): 506–517. **Brown.**

Our Coal Supplies. By T. Forster Brown.

Treats of the extent of the British coalfields as compared with those of Germany, the United States, China, and other countries.

United Kingdom—England. **Murray.**

A Handbook of Warwickshire. London: John Murray, 1899. Size 7 × 4½, pp. vi. 14, and 140. *Maps and Plans. Price* 6*s. Presented by the Publisher.*

The issue of this new handbook completes the description of the counties of England in Mr. Murray's series, which forms a remarkable compendium of the history of the country. The new volume is well illustrated by maps and plans.

United Kingdom—Hampshire. **Murray.**

A Handbook for Travellers in Hampshire. Fifth Edition. With Maps and Plans. London: John Murray, 1898. Size 7 × 5, pp. 18 and 214. *Price* 6*s. Presented by the Publisher.*

United Kingdom—Isle of Wight. **Jeans.**

A Handbook for Travellers in the Isle of Wight. With an Introductory Sketch of the History of the Island, by R. E. Prothero, M.A. Edited by the Rev. G. E. Jeans, M.A. Fifth Edition. London: John Murray, 1898. Size 7 × 4½, pp. 54 and 70. *Map. Price* 2*s.* 6*d. Presented by the Publisher.*

United Kingdom—London. **Ghewy.**

Real Municipal Government for London. A Scheme for the Government of the Area known as the Administrative County of London, with the "City" included, by applying the Municipal Corporation Acts. By Albert Brown Ghewy. London: printed by J. B. Nichols & Sons, 1899. Size 8½ × 5½, pp. 22.

United Kingdom—London. **Symons.**

Symons's Monthly Meteorolog. Mag. **34** (1899): 17–18.

Extremes of Temperature in London and its Neighbourhood for 104 years.

With reference to the high temperature (max. 64°·8) recorded in February, 1899, Mr. Symons has prepared a table of absolute maxima and minima of air-temperature in London at three stations. We reproduce those for Greenwich observatory for the period 1841–1890:—

Month	...	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Max.	...	57·0	62·3	71·5	81·5	87·0	94·5	97·1	94·2	92·1	81·0	67·3	62·4
Year	...	1843	1846	1848	1865	1868	1858	1881	1884	1868	1859	1847	1848
Min.	...	4·0	7·7	13·1	23·0	28·1	35·6	40·3	38·2	33·0	23·8	20·1	6·7
Year	...	1841	1845	1845('90)	1847	1877	1869	1863	1864	1885	1890	1890	1860

United Kingdom—Trade. *J.R. Statistical S.* **62** (1899): 1–82. **Giffen.**

The Excess of Imports. By Sir Robert Giffen.

A study of the excess of imports over exports in British trade, and of the distribution of the trade amongst foreign countries.

ASIA.

Armenia. *M.G. Ges. Hamburg* **15** (1899): 1–23. **Belck and Lehmann.**

Reisebriefe von der Armenischen Expedition der Herren Dr. W. Belck und Dr. C. F. Lehmann. *Also separate copy. Presented by Dr. L. Friederichsen.*

Asia Minor Railway. *B.S.G. Lyon* **15** (1899): 487–489. **Morel.**

Le chemin de fer projeté entre la Méditerranée et le Golfe Persique. Par M. Ennemond Morel.

Central Asia. *Verh. Ges. Erdk. Berlin* **26** (1899): 139–150. **Futterer and Holderer**

Dritter Bericht über die Reise durch Central-Asien und China. Von Prof. Dr. K. Futterer und Dr. Holderer.

This section of the journey from Kuku-nor to Shanghai was described in the *Journal* for April, vol. xiii. p. 430.

China. *B.S.G. Marseille* **22** (1898): 169–174. ——

En Chine: La part de la France. Par M. C. S.

China. *B.S.G. Com. Paris* **21** (1899): 80–97. ——

Notice géographique, ethnographique et commerciale sur le haut Fleuve Rouge (De Yuan-kiang à Man-hao). *With Map.*

China. *B.S.G. Italiana* **12** (1899): 156–163. **Carli.**

La baia di San-men. Nota del dott. Mario Carli. *With Map.*

China. *Rev. Française* **24** (1899): 157–164. **Servigny.**

Les chemins de fer en Chine. Par J. Servigny. *With Map.*

China. **Thomson.**

Through China with a Camera. By John Thomson. [Second Edition.] London and New York: Harper & Bros., 1899. Size 8½ × 6, pp. xvi. and 270. *Illustrations. Price 7s. 6d. Presented by the Publishers.*

This edition is enriched with additional notes and some additional illustrations, the reproduction and printing of which do justice to the beauty of the original photographs.

China—Hainan. *B.S.G. Genève* **38** (1899): 40–51. **Jeremiassen.**

Haïnan, l' île de l'Exil. Par M. Carl C. Jeremiassen.

Chinese Empire—Tibet. *C. Rd. S.G. Paris* (1899): 124–127. **Grenard.**

Voyage de M. et Mme Rijnhart dans le Tibet oriental. Par F. Grenard.

The Rijnharts made a missionary journey in Eastern Tibet in the summer of 1898; they started from Si-ning, passed Kuku-nor, and at Barong took the road to Lhasa, crossed the Tang-la and Tatsang passes, and reached the boundary of the kingdom of Lhasa, near Chungngoringmo and were turned back towards Tachienlu. The caravan was robbed by Tibetan bandits, M. Rijnhart was drowned or killed in fording a river, and Mme. Rijnhart entirely alone succeeded in regaining China.

Eastern Asia. **Széchenyi.**

Wissenschaftliche Ergebnisse der Reise des Grafen Béla Széchenyi in Ostasien 1877–1880. Dritter Band. Die Bearbeitung des gesammelten Materials. Wien: E. Hölzel, 1899. Size 11½ × 9, pp. viii. and 524. *Plates. Presented by the Author.*

This volume discusses the geological collections and meteorological observations made during Count Béla Széchenyi's great journey, and completes the scientific publications. It contains the photograph of a sketch of the city of Lhasa. The work which has now appeared in Hungarian and German is promised in English also as soon as a publisher can be found; the atlas and plates for the English edition are already prepared.

Eastern Asia. *Oester. Monats. Orient* **25** (1899): 25–31. **Wiesenburg.**

Die Wirthschaftsverhältnisse Ostasiens. Vom kaiserlichen Rath A. Wiesenburg.

Eastern Asia—Typhoons. *Meteorolog. Z.* **16** (1899): 145–157. **Bergholz.**

Die Taifune vom 9 und 29. September 1897. Von Dr. Paul Bergholz. *With Diagrams.*

India. *J. United Service I. India* **28** (1899): 1–24. **Sinclair.**

The First Sikh War, 1845–46. By Lieut.-Colonel H. M. Sinclair, R.E. *With Plans.*

India—Andaman Islands. **Portman.**

Notes on the Languages of the South Andaman Group of Tribes. By M. V. Portman. Calcutta, 1898. Size 11 × 9 pp. viii., 390, and 192. *Map. Presented by the India Office.*

This important study of the Andamanese languages is accompanied by a coloured map (the large-scale Admiralty chart) showing the districts occupied by the various tribes.

India—Assam. **Peal.**

Ein Ausflug nach Banpara von S. E. Peal. Nach der Original-Handschrift übersetzt und mit einer Einleitung versehen von Kurt Klemm. (Zeitschrift für

Ethnologie. Jahrg. 1898.) Size 10 × 6½, pp. 281–371. *Maps and Illustrations. Presented by the Translator.*

Translation of an article in the *Journal* of the Asiatic Society of Bengal, vol. 41, pp. 9–31.

India—Burma. *J. United Service I. India* **28** (1899): 34–55. **Keene.**

The Third Burmese War, 1885–87. By Major A. Keene. *With Map.*

India—Mysore. **Rice.**

Mysore. A Gazetteer compiled for Government. Revised Edition. By B. Lewis Rice. 2 vols. Vol. i.—Mysore in General. Vol. ii.—Mysore, by Districts. London: A. Constable & Co., 1897. Size 9 × 6, pp. (vol. i.) xx. and 834; (vol. ii.) viii. and 582. *Maps and Plates. Presented by the Publishers.*

The second edition of this valuable work is enriched with a profusion of excellent maps, historical, physical, economic, and topographical. The book is much more than a gazetteer, giving a complete account of Mysore from all points of view.

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The Tribes and the Land of the Panjáb. By Sir Charles Roe, Bart.

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Le Régime des Chemins de fer dans l'Inde Anglaise. Par J. Franconie. *With Map.*

India—Vizagapatam. **Bion.**

Notes on the Meteorology of Vizagapatam. Part i.—Rainfall. By W. A. Bion. Calcutta, 1898. Size 9½ × 6½, pp. 40. *Diagrams.*

Indian Ocean—Cocos-Keeling and Christmas Islands. **Farrer.**

Cocos-Keeling and Christmas Islands. Report on the Annual Visit for 1898. Colonial Reports, Annual. No. 257, 1899. Size 10 × 6½, pp. 16. *Price* 1*d.*

Japan. *J.G. Tōkyō G.S.* **9** (1897): 534–536, 590–594. **Nasa.**

Harbours of Japan. By T. Nasa. [In Japanese.]

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Miss. Catholiques **31** (1899): 6, 18, 31, 42, 55, 66, 81, 91, 104, 113, 126, 139, 148, 160. Japon historique et artistique (Kamakura et Nikko). Ruines et Mausolées. Par M. Michel Ribaud. *With Illustrations.*

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Tche-nam-po, nouveau port Coréen. Par A.-A. Fauvel. *With Map.*

Malay Archipelago. *Ann. Hydrographie* **27** (1899): 81–89, 123–136. ———

Riouw- und Lingga-Archipel.

Malay Archipelago. *C. Rd. S.G. Paris* (1898): 370–372. **Hiller, Hamson, and Furness.**

Insulinde. Voyage de MM. Hiller, et C. Hamson, et du Dr. W.-H. Furness. *With Map.*

Malay Archipelago—Borneo. *Contemporary Rev.* **75** (1899): 578–587. **Jardine.**

British North Borneo. By Sir John Jardine.

Malay Archipelago—Java. **Allan.**

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Anniversary Address. Java. By the Hon. Wm. Allan. *With Map.*

Philippine Islands. *B.S.G. Madrid, Rev.* **1** (1898): 249–251. ———

Archipiélago Filipino. Las islas Bisayas.

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The Philippine Islands. A Political, Geographical, Ethnographical, Social, and Commercial History of the Philippine Archipelago and its Political Dependencies, embracing the whole Period of Spanish Rule. By John Foreman. Second Edition, Revised and Enlarged. London: Low & Co., 1899. Size 9½ × 6½, pp. xvi. and 654. *Maps and Illustrations. Price* 21*s. Presented by the Author.*

Philippine Islands. *Oester. Monats. Orient* **25** (1899): 42–44. **Post.**

Die Philippinen. Von N. Post.

Discusses the geographical position and resources of the Philippines from an economic point of view.

Philippine Islands. *National G. Mag.* **10** (1899): 65–72. **Sonnenburg.**

Manila and the Philippines. By Major A. Falkner von Sonnenburg.

Philippine Islands. *National G. Mag.* **10** (1899): 33–64. **Tornow.**

The Economic Condition of the Philippines. By Max L. Tornow. *With Illustrations.*

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The Philippines and Round About, with some account of British Interests in these Waters. By Major G. J. Younghusband. London: Macmillan & Co., 1899. Size 9½ × 6, pp. xiv. and 230. *Map and Illustrations. Price* 8*s.* 6*d. Presented by the Publishers.*

Russia—Caucasus. **Rickmers.**

Z. Deutsch. u. Österreich. Alpenver. **29** (1898): 182–189.

Der Uschba im Kaukasus. Von Willy Rickmer-Rickmers. *With Illustrations.*

Also separate copy. *Presented by the Author.*

Russia—Siberia. *Scottish G. Mag.* **15** (1899): 178–185. ——

Olkhon and the Buriats.

Russia—Siberia. *Petermanns M.* **45** (1899): 67–70. **Romanow.**

Das Gouvernement Tomsk. Nach den statistischen Veröffentlichungen im sibirischen Handels- und Gewerbebuch von F. P. Romanow. Ins Deutsche übertragen von F. Thiess.

On the geography and statistics of the government of Tomsk, translated from the Russian.

Russia—Siberia. *Rev. Scientifique* **11** (1899): 391–402, 426–433. **Silnitzky.**

La province d'Anadyr (Sibérie orientale) et son administration. Par M. A. Silnitzky. *With Illustrations.*

The author is the editor of the *Official Journal* at Vladivostok, and the article is an account of a visit he paid to the extreme north-eastern province in 1896 on the annual supply-ship.

Russia—Siberia. *J. Linnean S. (Zoology)* **27** (1899): 23–46. **Elwes.**

On the Zoology and Botany of the Altai Mountains. By H. J. Elwes, F.R.S. *With Illustrations.*

Russia—Siberia. *P.R. Artillery J.* **26** (1899): 107–120. **Waters.**

The Trans-Siberian Railway. By Lieut.-Colonel W. H. H. Waters. *With Map.*

Russian Central Asia. **Gallois.**

B.S.G. Lille **30** (1898): 327–337; **31** (1899): 9–25, 80–103.

Excursion à la capitale de Tamerlan. Par M. Eugène Gallois. *With Map and Illustrations.*

A visit to Samarcand.

Russian Central Asia. **Krafft.**

Mittheilungen über das ost-bokharische Goldgebiet. Von Dr. Albrecht von Krafft. [From *Zeitschrift für praktische Geologie*, Jahrgang 1899. Februar.] Size 11 × 7½, pp. 37–43. *Sketch-map. Presented by the Author.*

Turkey—Palestine. **Bliss.**

Palestine Exploration Fund, Quarterly Statement (1899): 10–25.

First Report on the Excavations at Tell Zakarîya. By F. J. Bliss, PH.D. *With Map and Sections.*

Turkey—Palestine. **Dickson.**

Trade of Jerusalem and Jaffa for the year 1898. Foreign Office, Annual No. 2217, 1899. Size 10 × 6½, pp. 10. *Price* 1*d.*

Turkey—Palestine. *Ann. G.* **8** (1899): 160–169. **Mille.**

Colonies juives et allemandes en Palestine. Par M. P. Mille.

Turkey—Syria. *B.S.G. Italiana* **12** (1899): 62–63. **Manfredi.**

Nuova Carta della regione ad Oriente del Mar Morto, del P. don Giuseppe Manfredi. *With Map.*

The map, which takes in an area from 30° 55′ to 31° 50′ N. on the eastern side of the Dead sea, is drawn by Fathers Manfredi and Barberis of the Latin Patriarchate in Jerusalem.

Turkey—Syria. *Palestine Exploration Fund, Quarterly Statement* (1899): 47–56. **Sykes.**

Narrative of a Journey East of Jebel ed-Druse. By Mark Sykes.

Western Asia. **Oppenheim.**

Vom Mittelmeer zum Persischen Golf durch den Haurān, die Syrische Wüste und Mesopotamien. Von Dr. Max Freiherrn von Oppenheim. Erster Band. Berlin: Dietrich Reimer (Ernst Vohsen), 1899. Size 10 × 7, pp. xvi. and 334. *Maps and Illustrations. Presented by the Publisher.*

This work is based on a journey from Beirut through the Hauran, the Syrian desert, and Mesopotamia to the Persian gulf in 1893, which has already been described in *Petermanns Mitteilungen*. But there is much more than the description of a journey in this finely illustrated volume, which carries on the narrative as far as the Euphrates, with many details regarding people and antiquities, and a number of excellent maps. A large-scale map of the route will accompany the second volume.

AFRICA.

Abyssinia. *B.S. Neuchateloise G.* **11** (1899): 137–162. **Buchs.**

Voyages en Abyssinie, 1889–1895. II^e^ Parti. Par Victor Buchs. *With Illustrations.*

Africa—Trade. ——

Trade and Shipping of Africa. Reprint, with additions, from the *Board of Trade Journal*, of articles dealing with the Trade, Shipping, Railways, and the Economic Condition generally, of the various divisions of the African Continent and of Madagascar. London: Eyre & Spottiswoode, 1899. Size 10 × 6½, pp. viii. and 120. *Maps. Price* 1*s.* 6*d.*

British East Africa—Uganda. **Ansorge.**

Under the African Sun. A description of Native Races in Uganda, Sporting Adventures, and other experiences. By W. J. Ansorge. London: W. Heinemann, 1899. Size 10½ × 6½, pp. xiv. and 356. *Illustrations. Price* 21*s.*

The description of life in Uganda is supplemented by accounts of the natural history collections made by the author.

British South Africa—Barotseland. *B.S. Neuchateloise G.* **11** (1899): 93–101. **Béguin.**

Au Bo-Rotse. Par Eugène Béguin.

The author was a missionary in Barotseland.

British West Africa—Ashanti. *B.S. Neuchateloise G.* **11** (1899): 116–118. **Perregaux.**

Le lac Obosomtwê. Par E. Perregaux.

An account of the old fetish lake of Ashanti.

Cape Colony. ——

Cape of Good Hope. Department of Agriculture. Annual Report of the Geological Commission, 1897. Cape Town, 1898. Size 10½ × 8, pp. 84. *Maps and Sections. Presented by the Commission.*

Cape Verde Islands. *B.S.G. Italiana* **12** (1899): 163–174. **Fea.**

Dalle Isole del Capo Verde. Lettera del Leonardo Fea. *With Illustrations.*

Congo State—Dwarf Tribes. *B.S.R.G. d'Anvers* **22** (1899): 277–279. **Dubrencq.**

Les populations naines de l'Afrique. Les nains du Haut-Bomokandi. Par M. lieutenant R. Dubreucq.

East Africa. *Mem. S.G. Italiana* **8** (1898): 199–223. **Vannutelli and Citerni.**

La seconda spedizione Bòttego nell' Africa Orientale. Conferenza di L. Vannutelli e C. Citerni, con una breve introduzione di G. Roncagli.

Egypt. **Brown.**

The Land of Goshen and the Exodus. By Major R. H. Brown, C.M.G. London: E. Stanford, 1899. Size 9 × 6, pp. 86. *Maps and Illustrations. Price* 5*s. Presented by the Publisher.*

Major Brown tells the story of the Israelites in the land of Goshen and their exodus in the light of the topography of the region, with which he is minutely acquainted, and by the aid of the most recent Egyptian discoveries. He disclaims any special knowledge as an Egyptologist, and cites the standard works of recognized authorities for all subjects outside his personal knowledge.

Egypt. ——

Egypt. No. 3 (1899). Report by Her Majesty's Agent and Consul-General on the Finances, Administration, and Condition of Egypt and the Soudan in 1898. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. iv. and 54. *Price* 6*d.*

Egypt. *Globus* **75** (1899): 189–193. ——

Unter den Beduinen der ägyptischen Wüste. Von R. T. K. *With Illustrations.*

French Congo. *Mouvement G.* **16** (1899): 193–198. ——

Les concessions au Congo Français.

French Congo. *Questions Dipl. et Colon.* **6** (1899): 449–458. **Bourdarie.**

La Colonisation du Congo Français. Par P. Bourdarie.

On the political organization of the colony of French Congo and the regulations affecting its development.

French Congo. *C. Rd. S.G. Paris* (1898): 355–359. **Bouysson.**

Renseignements sur la région côtière au nord de Libreville et sur le bas Ogôoué. Par M. J. Bouysson. *With Map.*

French Guinea. *C. Rd. S.G. Paris* (1899): 1–4. **Salesses.**

Le chemin de fer de Conakry au Niger navigable. Por le capitaine Salesses.

French Niger Territory. *Scottish G. Mag.* **15** (1899): 186–200. ——

The French Niger Territory.

French West Africa. *C. Rd. S.G. Paris* (1899): 12–15. **Blondiaux.**

Boucle du Niger.—Mission Blondiaux.

French West Africa. *C. Rd. S.G. Paris* (1898): 421–455. **Gentil.**

Réception de M. Émile Gentil Administrateur Colonial de l'Oubangui au Lac Tchad. *With Illustrations and Map.*

German East Africa. *B.S.G. Italiana* **12** (1899): 108–116. **Pestalozza.**

Notizie sull' Africa Orientale Tedesca, del socio cav. Giulio Pestalozza.

A report from the Italian consul in Zanzibar.

German East Africa—Kilimanjaro. *G.Z.* **5** (1899): 209–226. **Meyer.**

Die Gletscher des Kilimandjaro. Von Dr. Hans Meyer. *With Illustrations.*

Madagascar. ——

France. No. 1 (1899). Further Correspondence with the French Government respecting Madagascar. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. iv. and 58. *Price* 6*d.*

Madagascar. *C. Rd.* **128** (1899): 716–718. **Colin.**

Observations astronomiques et magnétiques faites sur la côte occidentale de Madagascar. Note du R. P. Colin.

Madagascar. *C. Rd. S.G. Paris* (1899): 16–33. **Jogan.**

Madagascar en 1898. Par Raymond Jogan.

Mauritius. **Anderson.**

The Sugar Industry of Mauritius. By James Forrester Anderson. Paper read at a meeting of the Royal Colonial Institute, December 13, 1898. (From the *International Sugar Journal*, April 1, 1899.) Size 8½ × 5½, pp. 172–184. *Presented by the Author.*

Portuguese East Africa. **McMaster.**

Trade of Beira for the year 1898. Foreign Office, Annual No. 2218, 1899. Size 10 × 6½, pp. 14. *Price* 1*d.*

St. Helena. *Imp. and Asiatic Quarterly Rev.* **7** (1899): 345–352. **Sterndale.**

St. Helena in ye olden tyme. By his Excellency R. A. Sterndale, Governor of St. Helena.

Somaliland. *B.S.G. Paris* **19** (1898): 432–488. **Poncins.**

Voyage au Choa, explorations au Somal et chez les Danakils. Par le Vicomte Edmond de Poncins. *With Map.*

South Africa—Great Fish Bay. *Ann. Hydrographie* **27** (1899): 100–102. ——

Von der deutschen Tiefsee-Expedition.

Description of Great Fish Bay and Tiger Peninsula from the *Valdivia.*

South Africa—Native life. *Globus* **75** (1899): 268–271. ——

Middlebrooks Photographieen aus dem Leben der Zulukaffern. *With Illustrations.*

Transvaal—Swaziland. *Geolog. Mag.* **6** (1899): 105–111. **Jones.**

Notes on the Geology of West Swaziland, South Africa. By Prof. T. Rupert Jones, F.R.S. *With Plan and Sections.*

Uganda. ———

Africa. No. 4 (1899). Papers relating to Events in the Uganda Protectorate and Lieut.-Colonel Macdonald's Expedition. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. 34. *Price* 3½*d.*

Uganda. *Imp. and Asiatic Quarterly Rev.* **7** (1899): 322–337. **Bourne**

The Uganda Protectorate and its Relation to the Sudan. By H. R. Fox Bourne.

Uganda. *J. United Service I. India* **28** (1899): 25–33. **Vaughan.**

From the Punjab Frontiers to Uganda. By Lieut. E. G. Vaughan.

Western Sudan. *Ann. G.* **8** (1899): 176–179. **Meyer—Schirmer.**

Histoire de la découverte et de la formation des États du Soudan occidental, d'après M. P. Const. Meyer. Par M. H. Schirmer.

NORTH AMERICA.

American Fishes. **Jordan and Evermann.**

B.U.S. National Museum, No. 47, Pts. ii. and iii. (1898): 1241–3136.

The Fishes of North and Middle America: A descriptive Catalogue of the Species of Fish-like Vertebrates found in the Waters of North America, North of the Isthmus of Panama. By D. S. Jordan and B. W. Evermann.

Canada. *Travel* **3** (1899): 559–564. **Taylor.**

Up the Mackenzie River to the Polar Sea. A Lady's Journey in Arctic America. By Miss Elizabeth R. Taylor. *With Map and Illustrations.*

Canada. *Scottish G. Mag.* **15** (1899): 126–138. **Tyrrell.**

Natural Resources of the Barren Lands of Canada. By J. B. Tyrrell, M.A., &c. *With Illustrations.*

Canada—British Columbia. **Penck.**

Z. Deutsch. u. Österreich. Alpenv. **29** (1898): 55–60.

Der Illecillewaetgletscher im Selkirkgebirge. Von Albrecht Penck. *With Illustrations.* Also separate copy. *Presented by the Author.*

Canada—British Columbia. *P. and T.R.S. Canada* **3** (1897): 91–112. **Campbell.**

The Origin of the Haidahs of the Queen Charlotte Islands. By John Campbell, LL.D.

Calls attention to the Melanesian character of the Haidah language.

Canada—British Columbia. *P. and T.R.S. Canada* **3** (1897): 85–90. **Hill-Tout.**

Notes on the Cosmogony and History of the Squamish Indians of British Columbia. By Prof. C. Hill-Tout.

Points out that fifty per cent. of the words of the Dené Indian vocabulary are pure archaic Chinese roots.

Canada—Geological Survey. ———

Summary Report of the Geological Survey Department for the year 1898. Ottawa, 1899. Size 10 × 6½, pp. 208.

Canada—Historical. *P. and T.R.S. Canada* **3** (1897): 3–38. **Bourinot.**

Canada during the Victorian Era: a Historical Review. By J. G. Bourinot, C.M.G., &c. *With Map and Illustrations.*

Canada—Labrador. *B.S.R.G. d'Anvers* **22** (1899): 283–295. **Richet.**

Rapport sur un projet d'expédition au Labrador. Par M. Étienne Richet.

Plan of a projected journey of exploration in the interior of Labrador.

Canada—New Brunswick. *P. and T.R.S. Canada* **3** (1897): 131–163. **Ganong.**

Upon Raised Peat-Bogs in the Province of New Brunswick. By W. F. Ganong. *With Maps and Diagrams.*

Canada—N.W.T. *B.S. Neuchateloise G.* **11** (1899): 176–195. **Petitot.**

De Carlton-House au Fort Pitt (Saskatchewan). Par Émile Petitot.

Canada—Rocky Mountains. *Alpine J.* **19** (1899): 441–466. **Collie.**

Climbing in the Canadian Rocky Mountains. By J. Norman Collie, F.R.S. *With Illustrations.*

Canada—Saskatchewan. *National G. Mag.* **10** (1899): 113–134. **Wilcox.**
Sources of the Saskatchewan. By Walter D. Wilcox. *With Sketch-map and Illustrations.*

Canada—Yukon District. *Questions Dipl. et Colon.* **6** (1899): 355–365. **Lamare.**
Au Klondyke. Par E. Janne de Lamare. *With Map.*

Canada—Yukon District. *Ymer* **19** (1899): 81–105. **Nordenskjöld.**
En expedition till Klondike och Yukon-territoriet sommaren 1898. Af Otto Nordenskjöld. *With Maps and Illustrations.*

Canada—Yukon District. *J.R. Colonial I.* **30** (1899): 227–235. **Shaw.**
Klondike. By Miss Flora L. Shaw—Discussion.

Mexico. **Wright.**
Picturesque Mexico. By Marie Robinson Wright. London: J. B. Lippincott Co. [1897]. Size 13 × 10½, pp. 446. *Illustrations. Presented by the Publishers.*
This is the outcome of a long visit to Mexico by an American journalist, who specially devoted himself to seeing the interesting features of the republic both in natural scenery and national life.

Mexico—Yucatan. **Peirce.**
Trade of Yucatan for the year 1898. Foreign Office, Annual No. 2208, 1899. Size 10 × 6½, pp. 10. *Price* 1*d.*

United States—California. *Sierra Club B.* **2** (1899): 270–277. **Bradley.**
Exploration of the East Creek Amphitheater. By Cornelius Beach Bradley. *With Map and Plate.*

United States—California. *Sierra Club B.* **2** (1899): 278–283. **Hutchinson.**
A neglected region of the Sierra. By Lincoln Hutchinson. *With Map and Plates.*

United States—Florida. **Willoughby.**
Across the Everglades. A Canoe Journey of Exploration. By Hugh L. Willoughby. London: J. M. Dent & Co., 1898. Size 8 × 5½, pp. 192. *Maps and Illustrations. Presented by the Publishers.*
The record of a yachting and canoe voyage along the coast of Florida and through the inland waters of the almost unexplored Everglades.

United States—Historical. *National G. Mag.* **10** (1899): 73–92. **Hill.**
The Original Territory of the United States. By Hon. David J. Hill, LL.D.
The paper recounts the circumstances of the growth of the Eastern colonies of America, and their consolidation into the United States.

United States—Mississippi. *J. Franklin I.* **147** (1899): 297–308. **Haupt.**
The Problem of the Mississippi. By Herman Haupt.
On various possible methods of regulating the Mississippi so as to prevent destructive floods in its lower course.

United States—New Orleans. **Vansittart.**
Trade of New Orleans and District for the year 1898. Foreign Office, Annual No. 2206, 899. Size 9½ × 6½, pp. 28. *Price* 2*d.*

United States—New York. *American J. Sci.* **7** (1899): 249–263. **Fairchild.**
Glacial Lakes, Newberry, Warren, and Dana, in Central New York. By H. L. Fairchild. *With Maps.*

United States—New York. *B. American G.S.* **31** (1899): 1–23. **Tarr.**
Physical Geography of New York State. By R. S. Tarr. *With Illustrations.*
This instalment deals with the lakes and swamps of New York State.

CENTRAL AND SOUTH AMERICA.

Argentina. *B.S. Neuchateloise G.* **11** (1899): 214–252. **Beck-Bernard.**
Missions Franciscaines du désert argentin. Par Madame Lina Beck-Bernard.

Brazil. **Beaumont.**
A Journey to the Diamond Fields of Minas Geraes, and Remarks on the Province of Minas Geraes. Foreign Office, Miscellaneous, No. 494. 1899. Size 10 × 6, pp. 30. *Price* 2*d.*
This is noticed in the *Journal* for June (vol. xiii. p. 661).

Brazil. **Maldonado-Ulloa.**

Relación de la Jornada y Descubrimiento del Rio Mana (hoy Madre de Dios) por Juan Álvarez Maldonado en 1567. Publicala Luís Ulloa. Sevilla, 1899. Size 8½ × 6½, pp. xxiv. and 54. *Map. Presented by M. Luis Ulloa.*

Brazil. *B.S. Languedoc G.* **21** (1898): 343–368. **Viala.**

Considérations économiques sur le Brésil. Par L. Fernand Viala.

Describes a journey to the north-west of Rio de Janeiro and the resources of the country.

Brazil—Exploration. *Rev. Trim. I. G. e Hist. Bahia* **5** (1898): 524–541. **Argollo.**

As explorações do Sr. Apolinario Frot, pelo Dr. Miguel de Teive e Argollo.

Central American Canals. *Petermanns M.* **45** (1899): 42–43. **Polakowsky.**

Vom Nicaragua-Kanal. Vom Panama-Kanal. Von Dr. H. Polakowsky.

Chile. *Z. Ges. Erdk. Berlin* **33** (1898): 393–399. **Philippi.**

Einige Worte über den unrichtigen Gebrauch des Wortes "Cordillera" in Chile. Von Dr. R. A. Philippi.

South America. **Brinton.**

On Two unclassified recent Vocabularies from South America. By Daniel G. Brinton, M.D. (Reprinted from *Proc. Amer. Philos. Soc.*, vol. xxxvii., No. 158.) 1898. Size 9½ × 6, pp. 4. *Presented by the Author.*

South America. **Frick.**

The Vassalage of South America. By John Frick. London, [1898]. Size 10½ × 8½, pp. 52. *Presented by the Author.*

On the financial relations of the South American republics.

South America—Gran Chaco. *Ymer* **19** (1899): 45–79. **Lindman.**

Några bilder från den sydamerikanska vildmarken El gran chaco. Af C. A. M. Lindman. *With Map and Illustrations.*

Venezuela. *Globus* **75** (1899): 177–180. **Sievers.**

Richard Ludwigs Reisen in Coro (Venezuela). Von W. Sievers.

West Indies. ——

West Indies. Correspondence relating to the Hurricane on September 10–12, 1898, and the Relief of Distress caused thereby. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. xii. and 132. *Price* 1*s.* 2*d.*

West Indies. **Fiske.**

The West Indies. A History of the Islands of the West Indian Archipelago, together with an Account of their Physical Characteristics, Natural Resources, and Present Condition. By Amos Kidder Fiske. New York and London: G. P. Putnam's Sons, 1899. Size 8½ × 5½, pp. xii. and 414. *Map and Illustrations. Price* 6*s. Presented by the Publishers.*

This little volume is prepared to meet the demand in America for authentic information as to the whole group of the West Indies, and it fulfils the promise of its title-page with a due regard to proportion and a readable conciseness.

AUSTRALASIA AND PACIFIC ISLANDS.

New South Wales. ——

New South Wales. Seventeenth Annual Report of the Department of Lands, being for the year 1896. Sydney, 1897. Size 13½ × 8½, pp. iv. and 106. *Maps and Plans. Presented by the Agent-General for New South Wales.*

New South Wales. ——

Annual Report of the Department of Mines and Agriculture, New South Wales, for the year 1897. Sydney, 1898. Size 13½ × 8½, pp. 216. *Plans. Presented by the Agent-General for New South Wales.*

New South Wales. **Watt.**

New South Wales. Department of Mines and Agriculture. Geological Survey. Mineral Resources. No. 4. Notes on the Occurrence of Bismuth Ores in New South Wales. By J. A. Watt, M.A., B.SC. Sydney, 1898. Size 9½ × 6½, pp. 12.

Queensland.

Report of the Surveyor-General for the year ending December 31, 1896. Brisbane. Size 13½ × 8½, pp. 18. *Plans.*

The Report contains a map showing the present position of the survey of Queensland, and plans showing the progress of the re-survey of Brisbane.

Queensland. *P. and I. Queensland Br. R.G.S. Australasia* **13** (1899): 1–12. **Collins.**

Early Explorations on the Logan, and the ascent of Mount Lindesay by Captain Logan in 1828. By R. M. Collins.

Queensland. **Skertchly.**

On the Geology of the country round Stanthorpe and Warwick, South Queensland, with especial reference to the Tin and Gold Fields and the Silver Deposits. By Sydney B. J. Skertchly. Brisbane: 1898. Size 13½ × 8½, pp. 98. *Maps.*

Samoa. *Globus* **75** (1899): 185–189. **Krämer.**

Die samoanische Königsfrage im Hinblick auf die letzten Ereignisse zu Apia. Von Dr. Augustin Krämer. *With Sketch-Map.*

Samoa. *Fortnightly Rev.* **65** (1899): 723–734. **Leigh.**

The Samoan Crisis and its Causes. By John George Leigh.

Solomon Islands. **Giglioli.**

Gli ultimi giorni dell' epoca della pietra Melanesia. Scettro o mazza con testa litica di singolare bellezza da Saa, Malanta, isole Salomone. Nota del prof. Enrico H. Giglioli. (Estratto dall' *Archivio per l'Antropologia e l'Etnologia*, vol. xxviii., Fasc. 2°—1898.) Size 10 × 6½, pp. 4. *Presented by the Author.*

South Australia. *J.R. Colonial I.* **30** (1899): 314–343. **Cockburn.**

South Australia as a Federal Unit. By Hon. J. A. Cockburn, M.D.

POLAR REGIONS.

Franz Josef Land. **Jackson.**

A Thousand Days in the Arctic. By Frederick G. Jackson. With Preface by Admiral Sir F. Leopold McClintock, K.C.B., F.R.S. Illustrated from Photographs by the Author and Drawings by R. W. Macbeth, A.R.A., Clifford Carlton, Harry C. Edwards, and F. W. Frohawk, from data furnished by the Author. With Five Original Maps. 2 vols. London and New York: Harper & Bros., 1899. Size 10 × 6½, pp. (vol. i.) xxii. and 552; (vol. ii.) xvi. and 580. *Price* 32*s*. *Presented by the Publishers.*

Mr. Jackson gives a full and richly illustrated account of the Jackson-Harmsworth expedition in Franz Josef Land, mainly in the form of a diary of the occurrences from day to day, which furnishes a vivid picture of the hard conditions of life and the difficulties in the way of work which were successfully overcome. A list of the game killed in Franz Josef Land is introduced, and there is a supplementary chapter on scurvy, including "An experimental inquiry into scurvy," by Prof. Vaughan Harley. An important appendix contains a summary of the scientific results, including a description of the birds' eggs by Mr. F. W. Frohawk, notes on the birds by Mr. Jackson, a summary of the botany by Mr. Fisher, and of the meteorological observations by Mr. Armitage, together with a discussion of the meteorological results by Mr. Strachan, of the Meteorological Office. Dr. Koettlitz and Messrs. Newton and Teall describe the geology, and various tables of magnetic, tidal, and other observations are given. There is a full index. A series of excellent maps shows how greatly the topography of Franz Josef Land has been elucidated by the expedition.

MATHEMATICAL GEOGRAPHY.

Angular Divisions. *B.S.G. Lille* **29** (1898): 244–275. **Tilmant.**

Mémoire contre la division du cercle en 400 grades et en faveur de l'adoption du système de 240 degrès. Par M. V. Tilmant.

Cartography. **Zöppritz and Bludau.**

Leitfaden der Kartenentwurfslehre. Für studierende der Erdkunde und deren Lehrer bearbeitet von Prof. Dr. Karl Zöppritz. In zweiter neubearbeiteter und erweiterter Auflage herausgegeben von Dr. Alois Bludau. Erster Teil: Die Projektionslehre. Leipzig: B. G. Teubner, 1899. Size 10 × 7, pp. x. and 178. *Presented by the Publisher.*

Map Representations. *M.G. Ges. Wien* **42** (1899): 19–24. **Heiderich.**

Schattenplastik und Farbenplastik. Von Prof. Dr. F. Heiderich.

A criticism of Dr. Peucker's 'Kartographische Studien.'

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Biogeography—Migration. **Van der Broeck.**

Le discours de M. Ed. Dupont à la séance publique du 16 décembre 1898 de l'Académie des sciences de Belgique, consacré à l'évolution, et au phénomène de la Migration. Étude critique. Par Ernest Van den Broeck. Extrait des Annales (Bulletin des séances) de la Société royale Malacologique de Belgique. Tome xxxiv. (1899).—Séance du 4 février 1899, pp. xi. à xxiv. Size 9½ × 6½. *Presented by the Author.*

Geophysics. *Science* **9** (1899): 665–674, 704–711. **Kelvin.**

The Age of the Earth as an Abode fitted for Life. By Lord Kelvin.

Glacial Action. *M.G. Ges. Hamburg* **15** (1899): 67–130. **Petersen.**

Geschiebestudien. Beiträge zur Kenntniss der Bewegungsrichtungen des diluvialen Inlandeises. Von Dr. Johannes Petersen. Erster Theil: 1, Basalt von Schonen; 2, Cancrinit-Aegirinsyenite von Särna; 3, Gesteine der Diabas-Familie. *With Map.*

A study of the erratic blocks transported by the glaciers of the great Ice Age.

Oceanography—Adriatic. **Riccò and Saija.**

Atti R.A. Lincei, Rendiconti **7** (1898): 339–344.

Osservazioni di temperatura e del colore delle acque fatte nell' Adriatico e nel Jonio. Nota riassuntiva di A. Riccò e G. Saija.

Oceanography—Pacific. *C. Rd. S.G. Paris* (1899): 79–80. **Girard.**

Température et densité de l'océan Pacifique et de la mer de Behring. Par Jules Girard.

Rivers. *J. Franklin I.* **147** (1899): 177–197. **Hazen.**

The Clarification of River Waters. By Allen Hazen.

Tides. **Moxly.**

The Tides simply explained, with practical hints to Mariners. By the Rev. J. H. S. Moxly. London: Rivingtons, 1899. Size 8 × 5½, pp. viii. and 152. *Price 5s. Presented by the Publisher.*

Mr. Moxly's objects in preparing this book are (1) to show that "tide-experts" have been misled into endeavouring to make the facts of nature fit their theory; and (2) to put forward a theory of the tide which explains the observed facts. The first chapter is devoted to the fallacies occurring in standard treatises on the tides. The later chapters combat the views of Prof. G. H. Darwin, Sir Robert Ball, Lord Kelvin, and the late Sir George Airy, and contain the description of the "equilibrium theory" put forward by the author in opposition to the "dynamical theory" of the mathematicians.

Zoogeography. **Palacký.**

Zeměpisné rozšíření želv. (The geographical distribution of turtles.) Napsal Dr. Jan Palacký. ("Věstník České Akademie císaře Františka Josefa pro vědy, slovesnost a umění." Roč. vi., 1897. Prague.) Size 11½ × 7, pp. 18. *Presented by the Author.*

Zoogeography. **Palacký.**

Die Verbreitung der Batrachier auf der Erde. Von Prof. Dr. J. Palacký. (Aus den Verhandlungen der k. k. zoologisch-botanischen Gesellschaft in Wien [Jahrgang 1898] besonders abgedruckt.) Size 9 × 6, pp. 10. *Presented by the Author.*

Zoogeography. **Palacký.**

La distribution des Ophidiens sur le Globe. Par J. Palacký. (Extrait des Mémoires de la Société Zoologique de France, tome xi. pp. 88–125, année 1898.) Paris. Size 10 × 6½. *Presented by the Author.*

Zoogeography. **Palacký.**

Die Verbreitung der Salamandriden. Von Prof. Dr. J. Palacký. (Sitzungsberichte der königl. böhmischen Gesellschaft der Wissenschaften. Mathematisch-naturwissenschaftliche Classe. 1898. XXXV.) Prag, 1898. Size 10 × 6, pp. 8. *Presented by the Author.*

Zoogeography. **Sclater.**

The Geography of Mammals. By William Lutley Sclater and Philip Lutley Sclater, PH.D., F.R.S. London: Paul & Co., 1899. Size 9½ × 6, pp. xviii. and 336.

Maps and Illustrations. Price 12*s. Two copies, one presented by the Authors, the other by the Publishers.*

In addition to seven chapters by Mr. W. L. Sclater, which have already been published in the *Geographical Journal*, this volume contains a paper by Dr. P. L. Sclater on the distribution of marine mammals. The seven remaining chapters have not previously been published, and deal respectively with the distribution of the monkeys and lemurs, the carnivora, the insectivores, bats and rodents, hyraxes, elephants and ungulates, cetaceans and sirenians, edentates, and finally marsupials and monotremes.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. **Ratzel.**

Anthropogeographie. Erster Teil: Grundzüge der Anwendung der Erdkunde auf die Geschichte. Von Dr. Friedrich Ratzel. Zweite Auflage. Stuttgart: J. Engelhorn, 1899. Size 8½ × 5½, pp. xviii and 604. *Presented by the Author.*

This new edition of Prof. Ratzel's famous work will be welcomed by all geographical students. In addition to the complete revision and rearrangement necessitated by the seventeen years which have elapsed since the first edition appeared, there is a valuable list of important writings on anthropogeography. The new edition is 100 pages longer than the old.

Anthropology. **Keane.**

Man, Past and Present. By A. H. Keane. Cambridge: University Press, 1899. Size 8 × 5½, pp. xii. and 584. *Illustrations. Price* 12*s. Presented by the Publishers.*

This important work is intended as a supplement to the author's 'Ethnology.' It deals systematically with the primary divisions of mankind, taking up each group in turn, and the statements are fortified by an immense number of references, which the advanced student will find of the utmost service.

BIOGRAPHY.

Barbier. *B. Trim. S.G. de l'Est* (1898): 193-222. **Pfister.**

Joseph-Victor Barbier. Par Ch. Pfister. *With Portrait.*

Biographical Dictionary. **Lee.**

Dictionary of National Biography. Edited by Sidney Lee. Vol. lviii. Ubaldini. —Wakefield. London: Smith, Elder & Co., 1899. Size 10 × 6¼, pp. vi. and 464. *Price* 15*s.*

The following names of geographical interest appear among the notices in this volume:—Captain George Vancouver, by Prof. J. K. Laughton; Francis Vernon, by G. Le Grys Norgate; Godfrey Thomas Vigne, by E. Irving Carlyle; William Vincent, by G. Le Grys Norgate; Armagil Waad or Wade, by A. F. Pollard; George Waddington, by W. P. Courtney; Lionel Wafer, by Prof. J. K. Laughton.

Coello, Barbier, Gebelin, Lièvre. **Drapeyron.**

B.S. Topographie France **22** (1898): 141-144.

Le Colonel F. Coello, J.-V. Barbier, J. Gebelin, and A.-F. Lièvre. Par L. Drapeyron.

Coello y Quesada. *Deutsche Rundschau G.* **21** (1899): 328-330.

D. Francisco Coello de Portugal y Quesada. *With Portrait.*

Dufresne. *B.S.G. Genève* **38** (1899): 91-94. **Chaix.**

Le Dr. Edouard Dufresne, ancien Président de la Société de Géographie de Genève, 1818-1898. Par E. Chaix.

GENERAL.

Ballooning. *Meteorolog. Z.* **16** (1899): 49-58. **Hergesell.**

Ergebnisse der internationalen Ballonfahrten. Von H. Hergesell. *With Diagrams.*

British Colonies. **Zimmermann.**

Die Europäischen Kolonien. Dritter Band. Die Kolonialpolitik Grossbritanniens. Zweiter Theil. Vom Abfall der Vereinigten Staaten bis zur Gegenwart. Von Dr. Alfred Zimmermann. Berlin: E. S. Mittler und Sohn, 1899. Size 9½ × 6, pp. xiv. and 408.

Cosmogony. **Duponchel.**

B.S. Languedoc G. **19** (1896): 455; **20** (1897): 204, 363, 477; **21** (1898): 227, 369. Nouvelle théorie cosmogonique. Par M. A. Duponchel.

Former instalments of this treatise are noted in the *Journal* for June, 1897, ix. p. 689.

Education in Germany. *Petermanns M.* **45** (1899): 91–94. ———

Der geographische Unterricht an den deutschen Hochschulen im Sommersemester 1899.

Travel. **Taylor.**

Vacation Days in Hawaii and Japan. By Charles M. Taylor. Jr. Philadelphia: G. W. Jacobs & Co., 1898. Size 8½ × 6, pp. 362. *Illustrations. Presented by the Author.*

A brightly written and neatly illustrated record of a holiday trip.

Tropical Diseases. **Crosse.**

The Treatment of Malaria and Blackwater Fever. A Paper read before the Physical Society on Monday, October 3, 1898. By W. H. Crosse. London: Ash & Co., 1898. Size 6½ × 4, pp. 24. *Presented by the Author.*

The author strongly upholds the use of quinine in blackwater fever, and denies the truth of Dr. Koch's view that this type of fever is a result of quinine-poisoning.

Zoogeographical Classification. **Harvie-Brown.**

On a Correct Colour Code, or Sortation Code in Colours, to serve for mapping the Zoogeographical Regions and Sub-Regions of the World, and also to be of use as an Eye-Index for Librarians. By J. A. Harvie-Brown. (Extracted from the 'Proceedings of the International Congress of Zoology,' Cambridge, 1898.) Size 10 × 6½, pp. [4].

A scheme of classification by the use of coloured cards, a different colour being used for each of the recognized faunal realms.

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**

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8, 12; XVII. 2, 3, 4, 6, 8, 9; XVIIA. 1, 9; XXII. 3; XXIII. 11; XXV. 7, 8, 12. **Glamorganshire,** X. 5, 6, 10, 13; XVI. 2, 14, 15; XXV. 2, 3, 4, 7, 9; XXVI. 2, 3, 6, 7, 10; XXXIX. 8, 12, 15; XLIV. 2, 3, 6, 7, 8, 10, 11. **Notts.,** I. 11, 14, 15; II. 8, 12, 16; III. 1, 2, 3, 5 and 9, 6, 7, 10, 11, 12, 13, 14, 16; IV. 6, 7, 9, 10, 12; V. 3; XXVII. 7. **Oxfordshire,** XXX. 7, 8, 11, 12, 15, 16; XXXI. 1, 2, 3, 5, 6, 9, 10, 11, 13, 14, 15; XXXII. 6, 7; XXXVI. 3, 4, 7, 11, 12, 16; XXXVII. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14; XXXVIII. 2, 3, 6, 7, 9, 10, 11, 13, 15; XLIII. 4; XLIV. 1; XLV. 15; XLVI. 5; LV. 8. **Staffordshire,** III. 12; VII. 7, 12; VIII. 3; IX. 13; XIII. 14; XIV. 5, 9. **Sussex,** XVI. 13; XXVII. 3, 7, 11, 15; XL. 3, 4, 5, 6, 7, 8, 9, 11, 13; LIV. 1, 3, 4, 7, 8, 11, 12, 15, 16; LV. 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 15, 16; LVI. 1, 2, 3, 5, 7, 8, 9, 10, 11, 12, 14, 15; LVII. 5; LIX. 1, 2, 3, 5, 6; LXVII. 5, 7; LXVIII. 2, 4, 6, 9, 10, 12; LXX. 3. *3s. each.*

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Balkan Peninsula. **Mach.**

Karte der Schulsphären der türkischen Balkan-Halbinsel. Entworfen und gezeichnet von Richard von Mach. Scale 1: 3,700,000 or 58·4 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1899, Tafel 8. Gotha: Justus Perthes, 1899. *Presented by the Publisher.*

Cerigo Island. **Leonhard.**

Originalkarte der Insel Kythera (Cerigo). Auf Grund der englischen Küstenaufnahme und eigener Beobachtung entworfen und gezeichnet von Dr. R. Leonhard. Scale 1: 100,000 or 1·6 stat. mile to an inch. *Petermanns Geographische Mitteilungen*, Ergänzungsheft No. 128. Gotha: Justus Perthes, 1899. *Presented by the Publisher.*

Historical Atlas. **Poole.**

Historical Atlas of Modern Europe, from the Decline of the Roman Empire; comprising also maps of parts of Asia and of the New World connected with European History. Edited by Reginald Lane Poole, M.A., PH.D., Fellow of Magdalen College, and Lecturer in Diplomatic in the University of Oxford. Part xxii. Oxford: The Clarendon Press; London, Edinburgh, Glasgow, and New York: Henry Frowde, M.A.; Edinburgh: W. & A. K. Johnston. 1899. *Price 3s. 6d. each part. Presented by the Clarendon Press.*

This part contains Maps 11 and 12, Central Europe, 1795–1810, by H. A. L. Fisher, M.A.; Map 75, The Four Eastern Patriarchates, by E. W. Brooks, M.A. Each of these maps is accompanied by explanatory letterpress.

ASIA.

China. **China Inland Mission.**

Map of China, prepared for the China Inland Mission, 1898. Scale 1: 3,168,000 or 50 stat. miles to an inch. By permission of E. Bretschneider. London: E. Stanford, 1899. 4 sheets. *Price 10s.*

This map has been produced, by permission, from Bretschneider's Map of China. The positions of the stations of the China Inland Mission, as well as those of other Protestant missions, are indicated; the importance of each city or town is shown by the symbol employed to mark its position; and all the principal roads, as well as the few existing railways, are laid down.

AFRICA.

Central Africa. **Foà.**

Traversée de l'Afrique Équatoriale du Zambèze au Congo Français par Edouard Foà, chargè de Missions par Mr. le Ministre de l'Instruction publique. Août 1894—Novembre 1897. Scale 1: 7,500,000 or 102 stat. miles to an inch. Paris: J. Hansen, 1899. *Presented by the Author.*

AMERICA.

Canada. **Dawson.**

Geological Survey of Canada. Scale 1: 253,440 or 4 stat. miles to an inch. Shuswap Sheet. No. 11, British Columbia. G. M. Dawson. 1899. Geological Survey of Canada. *Presented by the Geological Survey of Canada.*

The geological survey of this district is published on two sheets, on one of which the topographical features and economic minerals are shown; the other is geologically coloured, explanatory notes being given on the margin. Roads, pack-trails, and exploratory routes are shown on both sheets; heights above sea-level are given in feet; and contours are drawn at vertical intervals of 250 feet.

AUSTRALIA.

Australia. **Bartholomew.**

Reduced Survey Map of Australia. Scale 1 : 6,000,000 or 95 stat. miles to an inch. By J. G. Bartholomew, F.R.G.S. Edinburgh : J. Bartholomew & Co., 1899. *Presented by the Publishers.*

Australia. **Muller.**

Remarkable maps of the XVth, XVIth, and XVIIth Centuries; reproduced in their original size. II.-III. (Supplement). Huych Allardt's Map of India (the part delineating Australia). With notes by J. E. Heeres, LL.D. Professor at the Dutch Colonial Institute, Delft. Amsterdam : Frederik Muller & Co. (F. Adama van Scheltema and Anton Mensing), 1899.

This is a supplementary map to Parts II. and III. of the series of 'Remarkable Maps of the XVth, XVIth, and XVIIth Centuries,' edited by the late Mr. C. H. Coote, and published by F. Muller & Co., Amsterdam. It is the part showing Australia, of Huych Allardt's Map of India. The date of this map is uncertain, but from information collected by Dr. J. E. Heeres, it appears to have been drawn between 1652 and 1653, and is certainly one of the earliest maps showing the results of Tasman's discoveries. It has not been considered necessary to reproduce the whole of Allardt's map, as the remaining portion was not considered by Dr. Heeres to have any important bearing on the discovery of Australia. The map is accompanied by a sheet of explanatory letterpress.

Queensland. **Geological Survey Office, Brisbane.**

Geological Map of Charters Towers Goldfield. Scale 88 yds. to an inch. Geological lines by R. L. Jack, W. H. Rands, and A. Gibb Maitland. Topography by William Thompson, 1898. Geological Survey Office, Brisbane. 2nd edition, showing underground workings. 6 sheets. *Presented by R. L. Jack, Esq.*

GENERAL.

World. **Paris.**

Atlas Melin : Historique et Géographique. Spécialement établi pour les Cours de l'Enseignement Secondaire. No. 4. André Paris, Editeur à Moulins sur-Allier.

Part III. of this atlas was noticed in the *Geographical Journal*, May, 1897. That now issued, like those which have previously appeared, is divided into two sections, historical and geographical. It contains 120 maps and plans, and has been specially prepared for educational purposes.

Charts.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, March and April, 1899. *Presented by the Hydrographic Department, Admiralty.*

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2776 h.	River Niger:—Plans added, Tangbogi rapids, Buka passage, Moji passage.
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Charts Cancelled.

No.		Cancelled by	No.
333	Mohawk bay.		
2427	Salem, Marblehead, and Beverly harbours.	New chart. Salem, Marblehead, and Beverly harbours	2427
1648	San João islands.		
1647	San Aleixo island.	New chart.	
539	Port Maceio.	Plans on the north and east coasts of	
2078	Benevente to Itapemirim.	Brazil	539
543	San Sebastião channel.		
709	Priaman to Ujong Indrapura.	New chart. Ujong Masang to Ujong Indrapura . .	709
1342	Plan of Vung gang bay on this chart.	New plan. Vung gang bay on this sheet.	3028
2921	Claremont point to Cape Direction.	New chart. Claremont point to Cape Direction . .	2921

Charts that have received Important Corrections.

No. 1991, England, south coast:—Folkestone harbour. 1967, England, south coast:—Plymouth sound. 871, England, south coast:—Tamar river. 2260, Ports on the south coast of Norway. 2966, Arctic Russia:—Port Ekaterininskoi and Pala bay. 2751, Spitsbergen. 438, France, north coast:—Cape d'Alprech to Ambleteuse. 1623, Spain, west coast:—Cadiz harbour. 1805, France, south coast:—Cette to Marseille. 1233, Black sea:—Kustenjeh anchorage. 2233, Black sea:—Sevastopol to Kertch strait. 1074, Bermuda:—Approach to Grassy bay. 296, Newfoundland:—Cape Bonavista to Bay Bulls. 2902, Newfoundland:—Motion head to Flat rock point. 2490, United States, east coast:—Pemaquid point to Fletcher's neck. 2489, United States, east coast:—Nantucket sound and eastern approaches. 442, Cuba:—Guantanamo harbour. 443, Cuba:—Port of Santiago de Cuba. 1966, South America, north coast:—Tortuga to Cape La Vela. 959, British Honduras:—Approaches to Belize. 2002, Brazil:—Rio Grande do Sul. 2816, Central America, west coast:—Parida and Palenque anchorages. 538, British Columbia:—Seymour narrows, Menzies bay. 1722, Africa, west coast:—River Cacheo. 1724, Africa, west coast:—Bijouga islands, Sheet II. 1727, Africa, west coast:—Bijouga islands, Sheet III. 149, Africa, west coast:—Old Calabar river. 143, Red sea:—Jebel Teïr to Perim island. 22, Persian gulf:—Kuweit harbour. 826, India, west coast:—Karáchi to Venguria. 830, Bay of Bengal:—Bassein river to Pulo Penang. 824, Bay of Bengal:—White point to Mergui. 825, Andaman islands. 2761, Sumatra, west coast:—Tyingkok bay to the strait of Sunda. 2597, Banka strait. 2195, Anchorages in the eastern part of Celebes. 2734, China, Si kiang or West river:—Sam chau to Chau sun. 1961, China sea:—Pescadores islands. 2823, China:—Wei hai wei harbour. 1260, China:—Chifu harbour. 2363, Tonga islands:—Tongatabu.

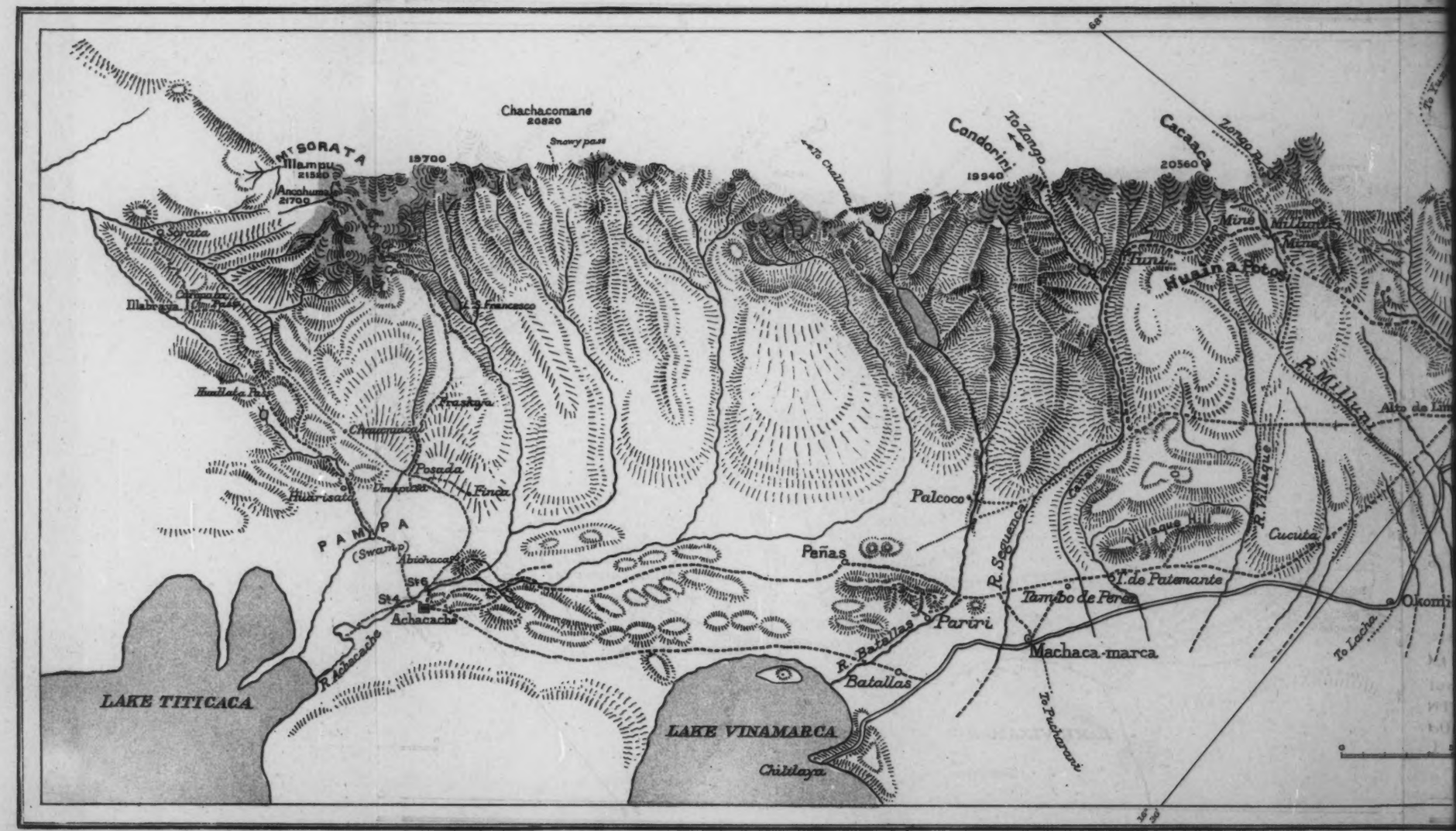
(*J. D. Potter, Agent.*)

United States Charts. **U.S. Hydrographic Office.**

Pilot Charts of the North Atlantic and North Pacific Oceans for June, 1899. Published at the Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



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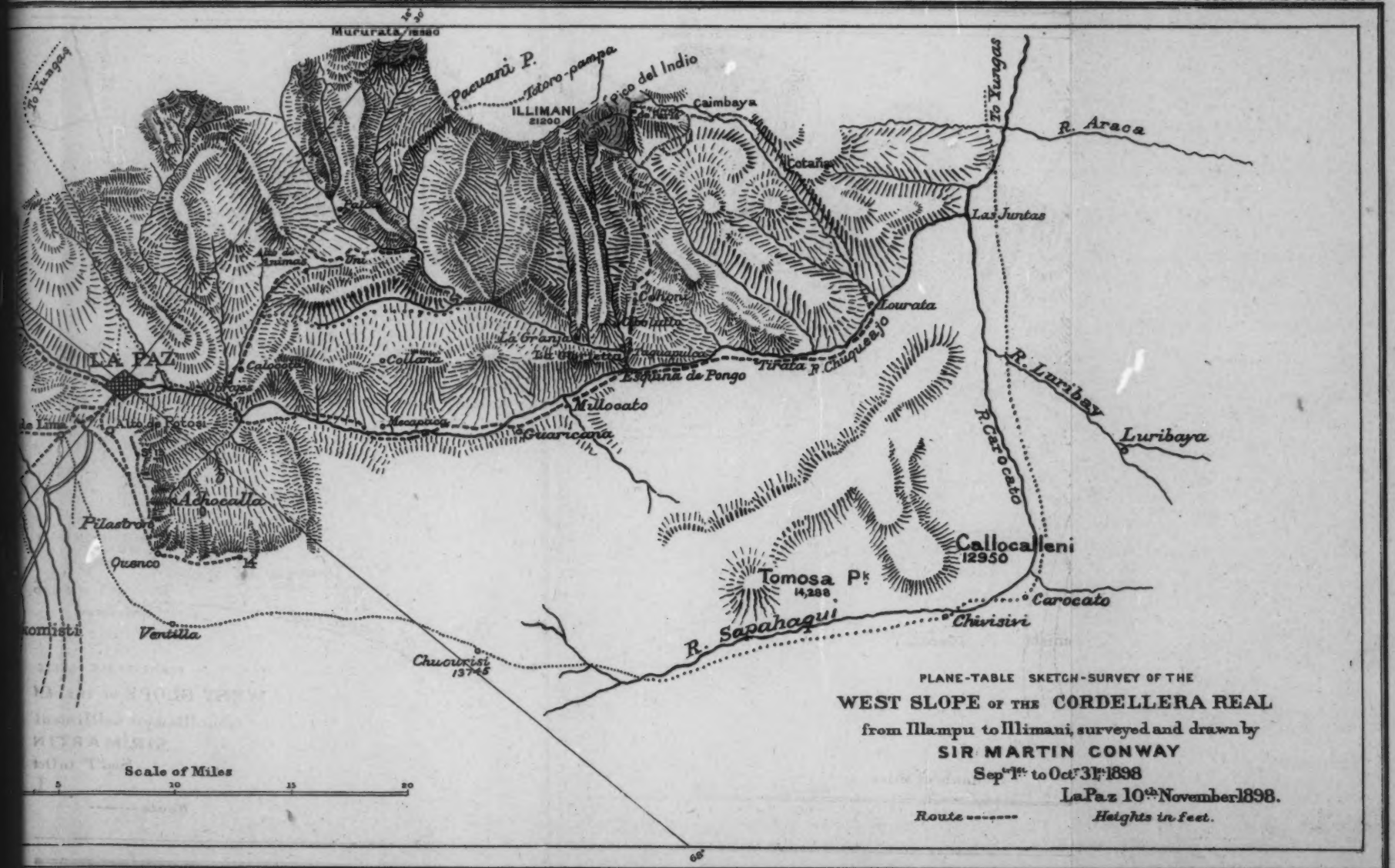
Mururata 19000
Pacuani P.
Totoro-pampa
Pico del Indio
ILLIMANI
21200
Caimbaya
Cotaña
R. Araca
Las Juntas
Lourata
Tirata
R. Chuquesjo
R. Luribaya
Luribaya
R. Carocato
LA PAZ
Calacoto
Collana
Esquina de Pongo
Millocato
Mocapata
Guaricana
Achocalla
Pilastro
Quenco
Callocalleni
12950
Tomosa Pk
14,288
Carocato
Chivisivi
R. Sapahaqui
Ventilla
Chucuyisi
13745
Scale of Miles
5
10
15
20
68°
PLANE-TABLE SKETCH-SURVEY OF THE
WEST SLOPE OF THE CORDELLERA REAL
from Illampu to Illimani, surveyed and drawn by
SIR MARTIN CONWAY
Sep.r 1st to Oct.r 31st 1898
La Paz 10th November 1898.
Route -------
Heights in feet.

MAP 1.

BOTTOM TEMPERATURE OF THE OCEAN BEYOND 1

Tropic of Cancer
Equator
Tropic of Capricorn
Antarctic Circle
SCALE OF COLOURING
BOTTOM TEMP.
OVER 60° F. = OVER 15°56 C.
50° TO 60° ,, = 10°00 TO 15°56 ,,
40° ,, 50° ,, = 4°44 ,, 10°00 ,,
35° ,, 40° ,, = 1°67 ,, 4°44 ,,
30° ,, 35° ,, = 1°11 ,, 1°67 ,,
UNDER 30° ,, = UNDER 1°11 ,,

Sir John Murray, K.C.B. LL.D. F.R.S.

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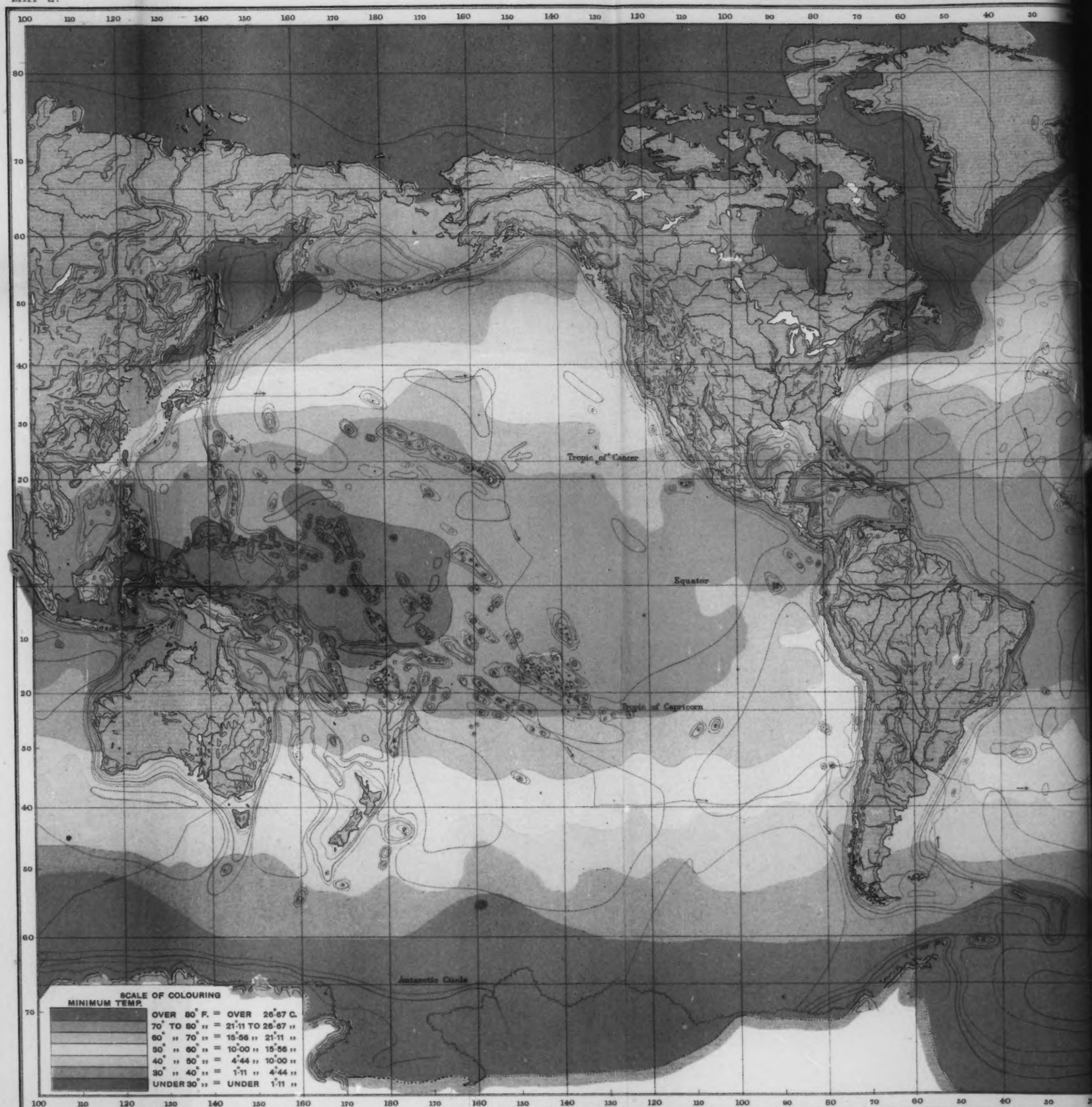
MAP 2.

MINIMUM SURFACE TEMPERATURE OF

(Constructed from the extreme Temperature in every two de


Tropic of Cancer
Equator
Tropic of Capricorn
Antarctic Circle
SCALE OF COLOURING
MINIMUM TEMP.
OVER 80° F. = OVER 26·67 C.
70° TO 80° ,, = 21·11 TO 26·67 ,,
60° ,, 70° ,, = 15·56 ,, 21·11 ,,
50° ,, 60° ,, = 10·00 ,, 15·56 ,,
40° ,, 50° ,, = 4·44 ,, 10·00 ,,
30° ,, 40° ,, = 1·11 ,, 4·44 ,,
UNDER 30° ,, = UNDER 1·11 ,,

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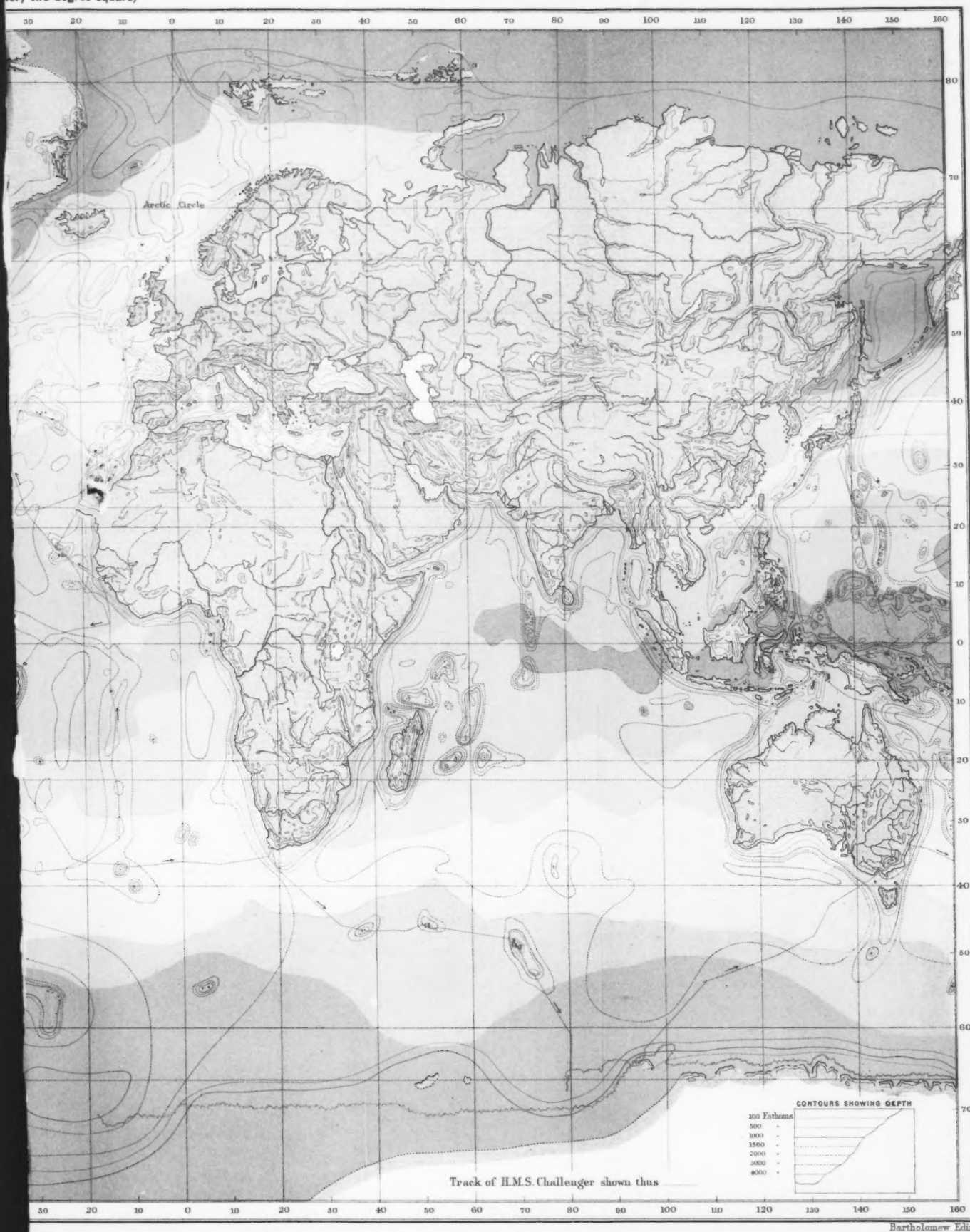
RE OF THE OCEAN

very two degree square)



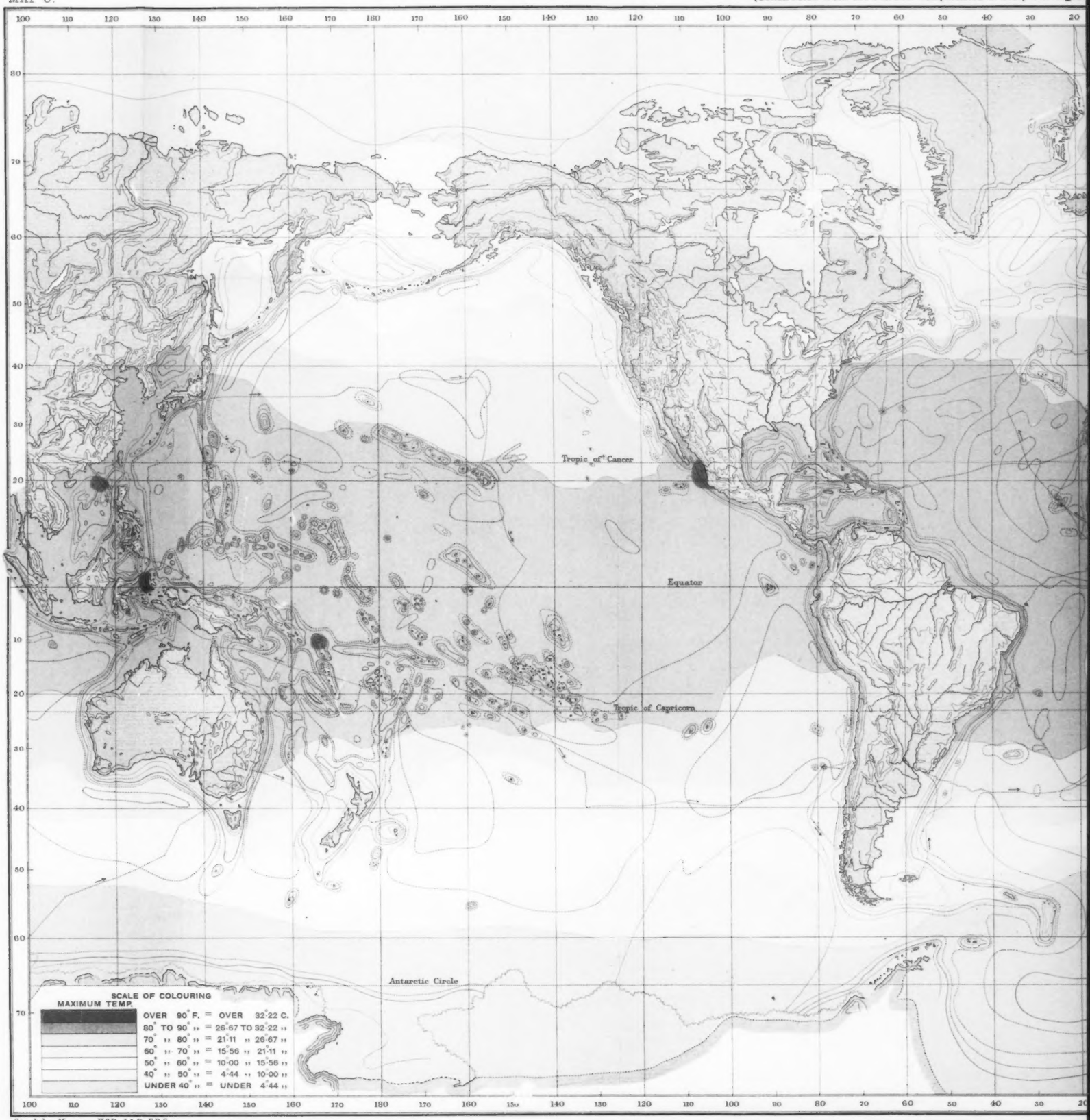
Bartholomew Edin^r

l Society.

MAP 3.

MAXIMUM SURFACE TEMPERATURE OF T

(Constructed from the extreme Temperature in every two degree


Tropic of Cancer
Equator
Tropic of Capricorn
Antarctic Circle
SCALE OF COLOURING
MAXIMUM TEMP.
OVER 90° F. = OVER 32·22 C.
80° TO 90° ,, = 26·67 TO 32·22 ,,
70° ,, 80° ,, = 21·11 ,, 26·67 ,,
60° ,, 70° ,, = 15·56 ,, 21·11 ,,
50° ,, 60° ,, = 10·00 ,, 15·56 ,,
40° ,, 50° ,, = 4·44 ,, 10·00 ,,
UNDER 40° ,, = UNDER 4·44 ,,

Sir John Murray, K.C.B. LL.D. F.R.S.

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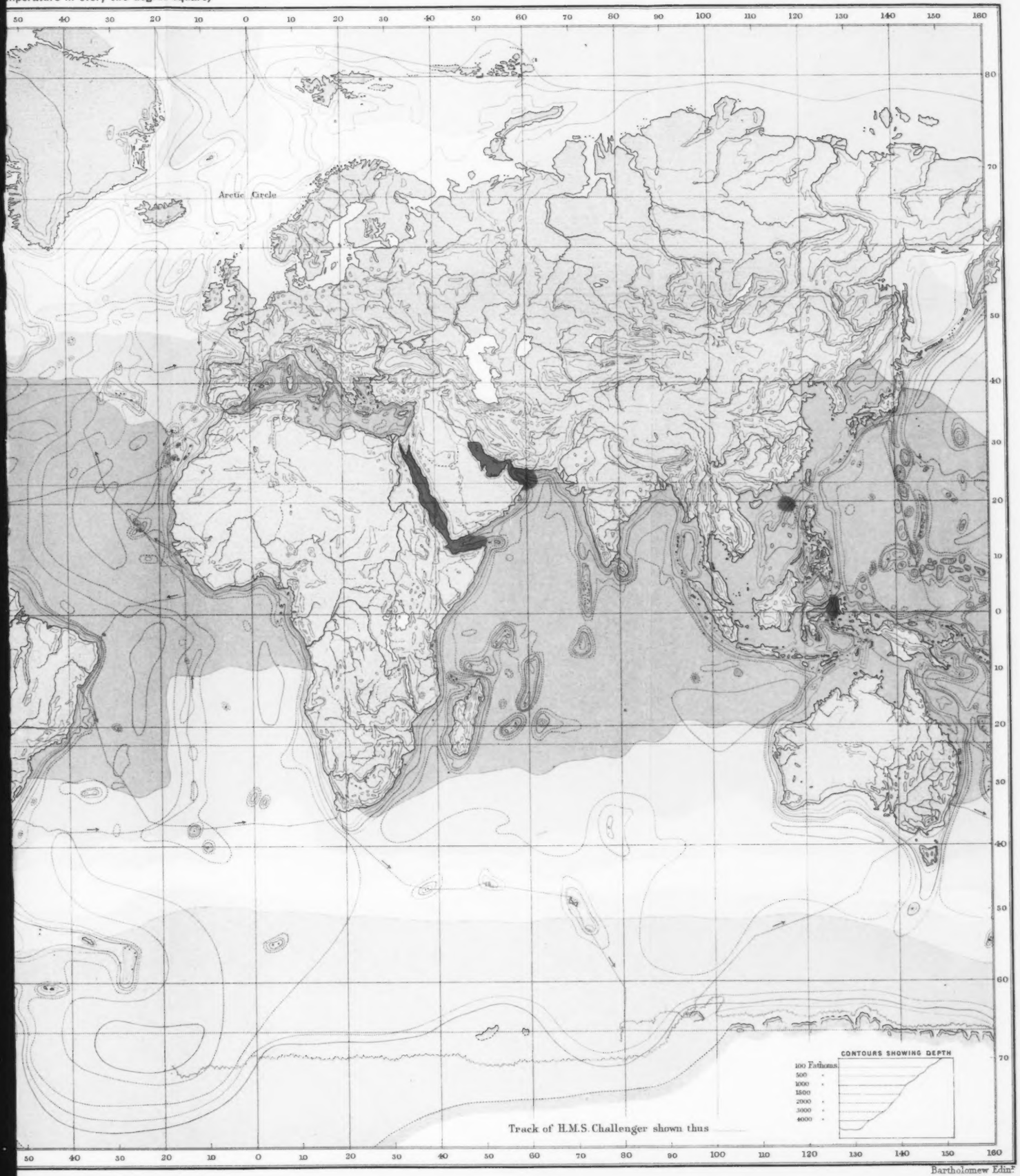
PERATURE OF THE OCEAN

mperature in every two degree square)



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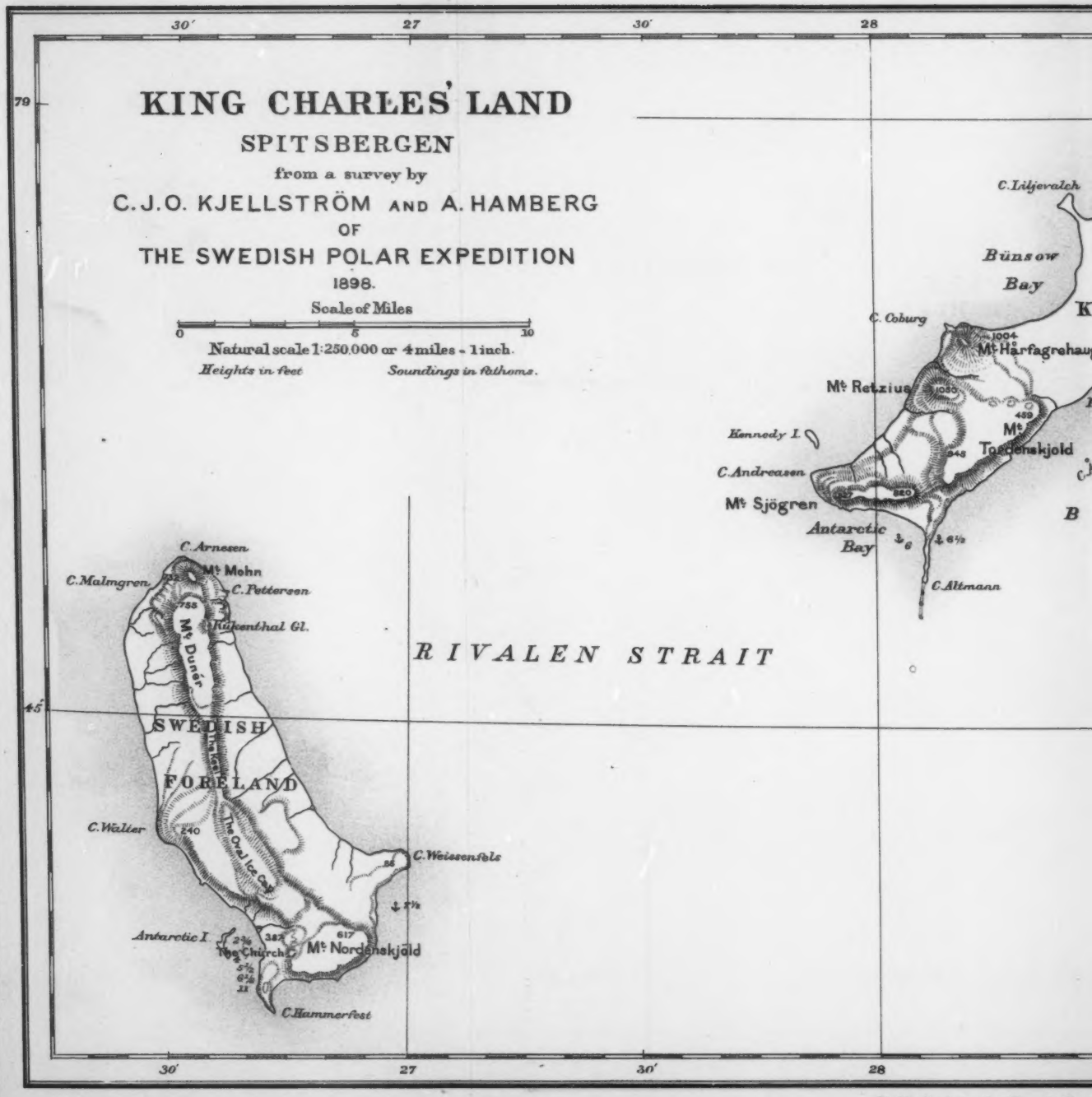

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